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Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-17696* + National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 37
Nov. 1973 151 p refs
(NASA-SP-7037(37)) Avail: NTIS HC $4.00 CSCL 01A

This special bibliography lists 511 reports, articles, and other documents introduced into the NASA scientific and technical information system in October, 1973. Author

N74-17697 Engineering Sciences Data Unit, London (England).
STABILITY DERIVATIVE (L SUB nu) SUB GAMMA. CONTRIBUTION OF FULL-SPAN DIHEDRAL TO ROLLING MOMENT DUE TO SIDESLIP
Apr. 1973 5 p refs
(ESDU-Aircraft-06.01.03-Amend-B) Copyright. Avail: Issuing Activity

Curves are presented for finding the dihedral of the rolling moment derivative due to sideslip. Author

N74-17698*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ESTIMATION OF DEVIATION ANGLE FOR AXIAL-FLOW COMPRESSOR BLADE SECTIONS USING INVISCID-FLOW SOLUTIONS
Max J. Miller Washington Mar. 1974 43 p refs
(NASA-TN-D-7549; E-7453) Avail: NTIS HC $3.25 CSCL 01A

Development of a method of estimating deviation angles by analytical procedures was begun. Solutions for inviscid, irrotational flow in the blade-to-blade plane were obtained with a finite-difference calculation method. Deviation angles for a plane cascade with a rounded trailing edge were estimated by using the inviscid-flow solutions and three trailing-edge hypotheses. The estimated deviation angles were compared with existing experimental data over a range of incidence angles at inlet flow angles of 30 deg and 60 deg. The results indicate that deviation angles can be estimated accurately (within 1 deg) by using one of the three trailing-edge hypotheses, but only when pressure losses are low. A new trailing-edge hypotheses is presented which is suitable (for the cascade considered) for both low- and high-loss operating points. Author

N74-17699*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLD-AIR STUDY OF THE EFFECT ON TURBINE STATOR BLADE AERODYNAMIC PERFORMANCE OF COOLANT EJECTION FROM VARIOUS TRAILING-EDGE SLOT GEOMETRIES. 1: EXPERIMENTAL RESULTS
Herman W. Prust, Jr. and Wayne M. Bartlett Washington Mar. 1974 29 p refs
(NASA-TM-X-3000; E-7743) Avail: NTIS HC $3.25 CSCL 01A

Trailing-edge slot configurations were investigated in a two-dimensional cascade of turbine stator blades. The trailing-edge slots were incorporated into blades with round trailing edges. The five blade configurations investigated included blades with two different trailing-edge thicknesses and four different slot widths. The results of the investigation showed that there was, in general, a significant increase in primary-air efficiency due to the coolant flow, the increase varying with slot configuration. For the five configurations tested, the average percent change in primary-air efficiency per percent coolant flow varied almost linearly from zero to about 1.4 percent over a range of coolant- to primary-air exit-velocity ratios between 0 and 1.2. However, for different configurations there was considerable deviation from the average values in the lower range of exit velocity ratios. Author

N74-17700# Nagoya Univ. (Japan).
THE MINIMUM INDUCED DRAG OF THE HEMI-ELLIPTIC GROUND EFFECT WING
Hiroshi Manada and Shigenori Ando 6 Aug. 1973 49 p Presented at Meeting of Japan Soc. for Aeron. and Space Sci., Nagoya, 20 Nov. 1972 Backup document for AIAA Synoptic, "Minimum Induced Drag of Hemi-elliptic Ground Effect Wing", scheduled for publication in Journal of Aircraft in May 1974
Avail: NTIS HC $5.50 CSCL 01A

A numerical analysis of the minimum induced drag of hemi-elliptic wings in ground effect is presented. The numerical process consisted of series expansion. Numerical results were obtained for two limiting cases. The numerical analysis is based on the assumption that the wing is expressed as the curved lifting line in the plane normal to the free stream. Author

N74-17701*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER PROGRAM FOR DEFINITION OF TRANSONIC AXIAL-FLOW COMPRESSOR BLADE ROWS
James E. Crouse Washington Feb. 1974 224 p refs
(NASA-TN-D-7345; E-7094) Avail: NTIS HC $5.75 CSCL 21E

A method is presented for designing axial-flow compressor blading from blade elements defined on cones which pass through the blade-edge streamline locations. Each blade-element centerline is composed of two segments which are tangent to each other. The centerline and surfaces of each segment have constant change of angle with path distance. The stacking line for the blade elements can be leaned in both the axial and tangential directions. The output of the computer program gives coordinates for fabrication and properties for aeroelastic analysis for planar blade sections. These coordinates and properties are obtained by interpolation across conical blade elements. The program is structured to be coupled with an aerodynamic design program. Author

N74-17702*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NORMAL LOADS PROGRAM FOR AERODYNAMIC LIFTING SURFACE THEORY
Richard T. Medan and K. Susan Ray, (Computer Sci. Corp., Mt. View, Calif.) Feb. 1974 94 p refs
(NASA-TM-X-62326) Avail: NTIS HC $7.75 CSCL 01A

A description of and users manual are presented for a U.S.A. FORTRAN 4 computer program which evaluates spanwise and chordwise loading distributions, lift coefficient, pitching moment coefficient, and other stability derivatives for thin wings in linearized, steady, subsonic flow. The program is based on a kernel function method lifting surface theory and is applicable to a large class of planforms including asymmetrical ones and ones with mixed straight and curved edges. Author

N74-17703*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
DRAG REDUCTION OBTAINED BY ROUNDING VERTICAL CORNERS ON A BOX-SHAPED GROUND VEHICLE
Edwin J. Saltzman and Robert R. Meyer, Jr. Mar. 1974 20 p refs
(NASA-TM-X-56023) Avail: NTIS HC $4.00 CSCL 01A

A box-shaped ground vehicle was used to simulate the aerodynamic drag of delivery vans, trucks, and motor homes. A coast-down method was used to define the drag of this vehicle in a configuration with all square corners and a modified configuration with the four vertical corners rounded. The tests ranged in velocity from 30 miles per hour to 65 miles per hour, and Reynolds numbers ranged from 4.4 x 1,000,000 to 1.0 x 10 to the 7th power based on vehicle length. The modified configuration showed a reduction in aerodynamic drag of about 40 percent as compared to the square cornered configuration. Author

N74-17704# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
SUPERSONIC AND TRANSONIC WIND TUNNEL TESTS ON A SLENDER OGIVE-CYLINDER BODY SINGLE AND IN COMBINATION WITH CRUCIFORM WINGS AND TAILS OF DIFFERENT SIZES Final Report
S. E. Gudmundson and L. Torngren Apr. 1972 115 p refs
(Contracts INK-11-12-93490; INK-11-12-02871)
(FFA-AU-772) Avail: NTIS HC $8.75

Wind tunnel tests were performed at different Mach numbers on a long cylindrical body with long ogive nose. Symmetrical forces were measured for the body alone and for different combinations of body and cruciform wings of two different sizes and cruciform tails of three different sizes. For one wing and tail size two different positions of the wing were tested. Normal force and pitching moment were also measured for the two wings alone. For two model configurations some investigations were made at two Mach numbers of the effect of different boundary layer transition trips. The results were compared with results from other wind tunnels. The agreement between the results is reasonably good. Author (ESRO)

N74-17705# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
SUPERSONIC AND TRANSONIC WIND TUNNEL TESTS ON SLENDER OGIVE-CYLINDER BODY SINGLE AND IN COMBINATION WITH CRUCIFORM WINGS AND TAILS OF DIFFERENT SIZES
S. E. Gudmundson and L. Torngren Apr. 1972 108 p
(Contracts INK-11-12-93490; INK-11-12-02871)
(FFA-AU-772-Suppl) Avail: NTIS HC $8.50
For abstract see, N74-17704.

N74-17706# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
NORMAL FORCE, PRESSURE POINT, AND TANGENTIAL FORCE CHARACTERISTICS OF SLENDER NOSE-CYLINDER CONFIGURATIONS IN THE MACH NUMBER RANGE FROM 0.8 TO 4.0 [DIE NORMALKRAFT-, DRUCKPUNKT- UND TANGENTIALKRAFTCHARAKTERISTIKEN SCHLANKER BUG-ZYLINDER-KONFIGURATIONEN IM MACHZAHLBEREICH 0,8 BIS 4,0]
H. Barth Bonn Bundeswehramt 1973 60 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-73-32) Avail: NTIS HC $6.00; Bundeswehramt, 30 DM

A determination of aerodynamic coefficients for slender nose-cylinder configurations at Mach numbers from 0.8 to 4.0 is presented. The aerodynamic coefficients, obtained by wind tunnel tests, were investigated with regard to angle of attack and decomposed into a linear and nonlinear amount. These linear and nonlinear coefficients are graphically presented as functions of Mach number with the ratio of body length to body diameter as parameter. Author (ESRO)

N74-17707# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
RECIPROCAL INFLUENCE OF A BODY OF FINITE LENGTH AND A WING AT MID-WING POSITION AT SUBSONIC SPEED [ZUR GEGENSEITIGEN BEEINFLUSSUNG EINES ENDLICH LANGEN RUMPFES UND EINES FLUEGELS IN MITTELDECKERANORDNUNG BEI UNTERSCHALLSTROEMUNG]
G. Gregoriou Bonn Bundeswehramt 1973 41 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVg-FBWT-73-33) Avail: NTIS HC $5.25; Bundeswehramt, Bonn 30 DM

Based on potential theory an iterative singularity-method was developed which yields the pressure distribution of symmetric wing-body configurations at angle of attack at subsonic speed. The body is axisymmetric and of finite length. The wing is infinitely thin and located at mid-wing position. The results obtained were compared to both the results of other theories and the results of several wind tunnel tests. Author (ESRO)

N74-17708# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
CALCULATION OF AERODYNAMIC FORCES AND PRESSURE DISTRIBUTION ON AIRCRAFT WITH EXTERNAL LOADS AT SUBSONIC AND SUPERSONIC SPEEDS [BERECHNUNG DER LUFTKRAEFTE UND DRUCKVERTEILUNG AN FLUGZEUGEN MIT AUSSENLASTEN BEI UNTER- UND UEBERSCHALLGESCHWINDIGKEIT]
P. Kuehl Bonn Bundeswehramt 1973 30 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVg-FBWT-73-34) Avail: NTIS HC $4.50; Bundeswehramt, Bonn 20 DM

An existing computer program was used, after some modifications, to calculate pressures, forces, and moments acting on an aircraft with external-mounted stores. The program is a so-called panel-program, that is, the configuration of interest is replaced by a large number of small surface elements associated with one or more special types of singularity. The strength of these singularities is determined by the given boundary conditions. Once the singularity strengths are known, velocities and pressures may be easily computed. This method seems to be successful for difficult interference problems. Calculations were carried out for simple configurations such as a parabolic body of revolution or a flat delta wing in order to compare calculated results with exact theory available in these cases. Finally calculations were performed on configurations including stores. Results are presented and discussed, leading to proposals for an improvement of the program. Author (ESRO)

N74-17709# National Physical Lab., Teddington (England). Aerodynamics Div.
LOW-SPEED AERODYNAMIC CHARACTERISTICS OF NACA 0012 AEROFOIL SECTION, INCLUDING THE EFFECTS OF UPPER-SURFACE ROUGHNESS SIMULATING HOAR FROST
N. Gregory and C. L. OReilly Aeron. Res. Council 1973 35 p refs Supersedes ARC-31719; N71-11016
(ARC-R/M-3726; ARC-31719) Avail: NTIS HC $4.75; HMSO £1.35; PHI $5.30

Aerodynamic characteristics of NACA 0012 airfoil section at Reynolds numbers of 2.88 million and 1.44 million with some indications of scale effect at other Reynolds numbers are presented. The measurement of C sub Lmax at a Reynolds number of 2.88 million is uncertain. A laminar separation bubble disappears

intermittently. The flow broke down into a three-dimensional pattern when an appreciable extent of separation was present. Boundary-layer control by suction in the vicinity of the wing/wall junction is shown to improve the two-dimensionality in the early stages of separation, but does not inhibit the appearance of three-dimensional flow at and beyond the stall. Distributed roughness was progressively applied from the trailing edge forwards over the upper surface of the airfoil. Both sparse and dense distributions were used and they were intended to simulate the hoar frost deposit remaining after partial cleaning of the forward part of the airfoil. Subject to the above qualifications C sub Lmax, is not greatly reduced until the front edge of the roughness extends forward of 0.1 chord, at which stage also the drag increment due to the roughness rapidly becomes much larger. Author (ESRO)

N74-17710# Lockheed-Georgia Co., Marietta. Flight Sciences Div.

THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF VORTEX LIFT CONTROL BY SPANWISE BLOWING. VOLUME 1: EXPERIMENTAL RESEARCH Final Technical Report, 15 Apr. 1972 - 15 Sep. 1973

C. J. Dixon, J. G. Theisen, and R. M. Scruggs 15 Sep. 1973 123 p refs 2 Vol.

(Contract N00014-72-C-0237; NR Proj. 215-201)

(AD-771290; LG73ER-0169-Vol-1) Avail: NTIS CSCL 01/1

Experimental investigations of spanwise blowing as a means of controlling leading edge vortices and flow separation have been conducted in five phases. Significant results from each phase are reported in this volume. The five (5) phases are: Smoke Tunnel Flow Visualization; Laser Doppler Velocimeter Investigations of the flow field of an under-expanded jet near and parallel to a flat plate; force tests of spanwise blowing over a 45 degree swept horizontal tail configuration; force test with spanwise blowing on an Aspect ratio 4.4, 20 degree swept wing; and pressure tests on the 20 degree wing. (Modified author abstract) GRA

N74-17711# Lockheed-Georgia Co., Marietta.

THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF VORTEX LIFT CONTROL BY SPANWISE BLOWING. VOLUME 2: THREE-DIMENSIONAL THEORY FOR VORTEX-LIFT AUGMENTATION Final Technical Report, 15 Apr. 1972 - 15 Sep. 1973

Jerome G. Theisen, Roy M. Scruggs, and Charles J. Dixon 15 Sep. 1973 108 p refs 2 Vol.

(Contract N00014-72-C-0237)

(AD-771304; LG73ER-0169-Vol-2) Avail: NTIS CSCL 01/1

A theoretical description is presented on the experimentally observed phenomenon of wing leading-edge vortex lift control by spanwise mass injection. The vortex and jet initial source/sink strengths and locations are established by a conformal mapping solution, and used as starting conditions for an iterative vortex-lattice simulation. The spanwise jet is shown to augment the stability of a vortex which forms at high angles-of-attack in the leading-edge region where wings of moderate-to-high aspect ratio otherwise exhibit fully turbulent separation. Definitive results are obtained on wing lift and corresponding pressure distributions for comparison with the test data presented in Volume I. (Modified author abstract) GRA

N74-17712# Naval Weapons Lab., Dahlgren, Va.

ANALYSIS OF THE LINEAR PITCHING AND YAWING MOTION OF CURVED-FINNED MISSILES

Frank L. Stevens Oct. 1973 44 p refs

(AD-771352; NWL-TR-2989) Avail: NTIS CSCL 19/1

Maple-Synge theory is used to establish the analytical form of the aerodynamic forces and moments acting on a four-finned, curved-finned vehicle. The linearized equations of motion are solved, and the effects of the curved-finned aerodynamics on the stability of motion are investigated. It is shown that small and moderate values of yawing moment due to angle-of-attack, characteristic of curved-finned configurations, can have significant effects on both transient and steady-state stability.

Author (GRA)

N74-17713# National Aeronautical Establishment, Ottawa (Ontario). Low Speed Aerodynamics Section.

THE AERODYNAMICS OF BRIDGE ROAD DECKS AND THE ROLE OF WIND TUNNEL INVESTIGATIONS Final Report

R. L. Wardlaw Sep. 1973 42 p refs Presented at the 1st FCP Res. Progr. Rev. for Category 4 and 5, San Francisco, 17-20 Sep. 1973 Sponsored by DOT

(PB-224876/3GA; FHWA-RD-73-76) Avail: NTIS HC $4.25 CSCL 13B

The report presents a review of aerodynamic bridge deck instability. Wind tunnel section model tests of cable-stayed bridge decks are presented. A degree of streamlining of the bridge deck profile is shown to reduce vibrational amplitudes due to critical wind velocities to insignificant levels. Results of dynamic sectional model tests of the proposed Pasco-Kennewick Intercity cable-stayed bridge are presented. Author (GRA)

N74-17714# Army Missile Test and Evaluation Directorate, White Sands Missile Range, N.Mex.

RESULTS OF A TRANSONIC WIND TUNNEL INVESTIGATION OF THRUST EFFECTS ON THE AERODYNAMICS OF THE LONGBOW MISSILE CONFIGURATION

J. H. Henderson 12 Nov. 1973 81 p refs

(DA Proj. 1M2-62303-A-214)

(AD-771943; RD-TR-73-18) Avail: NTIS CSCL 20/4

Transonic wind tunnel tests were conducted on a strut-mounted model of the LONGBOW missile configuration to determine thrust effects on a body of revolution afterbody with fins located at various longitudinal positions. Thrust was simulated by a cold air axial jet. Base pressure and afterbody forces and moments were measured. The test was conducted at Mach numbers from 0.4 to 1.25 and at angles of attack from -2 degrees to 10 degrees. Jet thrust was varied from 0 to 400 pounds. Reynolds number per foot varied from 0.7 to 1.7 million. (Modified author abstract) GRA

N74-17715# Rochester Applied Science Associates, Inc., N.Y.

VORTEX MODIFICATION BY MASS INJECTION AND BY TIP GEOMETRY VARIATION Final Report

John C. Balcerak and Raymond F. Feller Jun. 1973 97 p refs

(Contract DAAJ02-72-C-0097; DA Proj. 1F1-62204-AA-41)

(AD-771966; RASA-73-01; USAAMRDL-TR-73-45) Avail: NTIS CSCL 01/1

The report describes an experimental research program in which the outer section of a UH-1D helicopter blade was modified to incorporate a system for injecting the trailing tip vortex produced by the blade with a mass of linearly-directed air, and also an Ogee-tip section to study its effect as a passive system on vortex dissipation. The effects of mass injection were investigated at low mass flow rates, at near-sonic injection velocities, and with a two-section nozzle. The results are presented in terms of quantitative measurements of circulation strength as a function of mass flow rate and thrust, and are correlated with the results from previous research done at RASA. Also presented are flow-visualization studies which were conducted using illuminated helium bubbles, smoke, and tuft grids. The results of this research program present additional confirming evidence that mass injection of the concentrated tip vortex is a practical approach to the elimination of the strong induced effects on a lifting surface of the circulatory flow associated with a concentrated vortex generated at the tip of a helicopter rotor blade.

Author (GRA)

N74-17716# Ballistic Research Labs., Aberdeen Proving Ground, Md. Exterior Ballistics Lab.

ESTIMATION OF THE STATIC AERODYNAMIC CHARACTERISTICS OF ORDNANCE PROJECTILES AT SUPERSONIC SPEEDS

Robert L. McCoy Nov. 1973 69 p refs

(DA Proj. 1T5-62603-A-041)

(AD-771148; BRL-1682) Avail: NTIS CSCL 19/1

A simplified flow field solution has been programmed in an attempt to improve the accuracy of estimates of the static aerodynamic characteristics of ordnance projectiles. It provides estimates of drag, normal force, static moment, and roll damping moment for pointed bodies of revolution at supersonic speed. The program combines the Van Dyke hybrid theory for potential flow, the Van Driest compressible turbulent boundary layer theory, and the Chapman-Sternberg model for supersonic base pressure.

Good agreement is demonstrated between the theoretical and experimental data. Author (GRA)

N74-17717# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
AERODYNAMIC COEFFICIENTS AND PRESSURE DISTRIBUTION OF SOLID FLAT AND RINGSLOT MODELS IN ONE-DIMENSIONAL VELOCITY GRADIENTS Final Report, Feb. 1970 - Jul. 1972
H. G. Heinrich, R. A. Noreen, and J. N. Dale Dec. 1973 88 p refs
(Contract F33615-68-C-1227; AF Proj. 6065)
(AD-771771) Avail: NTIS CSCL 01/3

The results of wind tunnel studies of the aerodynamic characteristics of solid flat and ringlsot parachute models in flow with several linear one-dimensional dynamic pressure gradients are presented. The models had nominal diameters of about 16 in. Gradients of 0%, 10%, 20%, and 40% of centerline dynamic pressure per foot with centerline velocities of 60 ft/sec and 90 ft/sec were established for the tests. Surface pressure measurements were made on rigid porous models, and drag coefficients obtained by integration of the pressure distribution. Aerodynamic force and moment coefficients were determined from force measurements on flexible models. Author (GRA)

N74-17718# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
WORK UNIT 08 (V/STOL AERODYNAMICS) Final Report, May 1967 - Jun. 1973
J. S. Petty Nov. 1973 12 p refs
(AF Proj. 7064)
(AD-771811; ARL-73-0164) Avail: NTIS CSCL 01/1

The objective of Work Unit 08(V/STOL Aerodynamics) was the study of the low speed aerodynamics of V/STOL configurations, with particular emphasis on the fan-in-wing. Principal items of research accomplished under WU 08 include studies of airfoils with single and double inlets on their upper surfaces and lift fan inlet interference phenomena. A definitive paper from the German literature on the roll-up of a jet in a cross flow was translated into English. (Modified author abstract) GRA

N74-17719# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
AN ALTERNATIVE FORMULATION OF THE LIFTING LINE WING EQUATION AND ITS SOLUTION
Theodore H. Gawain Dec. 1973 50 p refs
(AD-771981; NPS-57GN73121A) Avail: NTIS CSCL 01/1

In the report, the standard wing equation, as normally derived from lifting line theory, is further refined and a solution procedure more basic than the usual collocation technique is developed. The calculation method adopted avoids the necessity of performing an explicit matrix inversion; all equations can be solved sequentially, one at a time. On the other hand this technique involves the evaluation of numerous integrals over the span. The calculations are cumulative, and can be carried as far as necessary to achieve any required degree of accuracy. The analysis is interesting not only for purposes of practical calculation but also for the light it sheds on the essential mathematical structure of the basic aerodynamic phenomena involved. This same general method of calculation can also be readily adapted to the solution of other common types of engineering problems. Author (GRA)

N74-18615 National Research Council of Canada, Ottawa (Ontario).
THE WIND TUNNEL DEVELOPMENT OF A LOW DRAG, PARTIALLY STREAMLINED MOTORCYCLE
K. R. Cooper *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 31 Dec. 1973 p 5-26 refs (For availability see N74-18613 09-34)

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-17720# Advisory Group for Aerospace Research and Development, Paris (France).
FLIGHT IN TURBULENCE
Nov. 1973 365 p refs Presented at the 42d Meeting of the Flight Mech. Panel of AGARD, Woburn Abbey, England, 14-17 May 1973
(AGARD-CP-140) Avail: NTIS HC $21.25

The proceedings of a conference on the effects of atmospheric turbulence on aircraft operation are presented. The subjects discussed include the following: (1) characteristics of atmospheric turbulence, (2) aircraft operational problems created by atmospheric turbulence, (3) analysis of wake vortices and wind shear, (4) structural loads and gust criteria, (5) aircraft design for performance under turbulent conditions, and (6) application of energy management concepts to flight path control in turbulence For individual titles, see N74-17721 through N74-17746.

N74-17721 Meteorological Office, Bracknell (England).
TURBULENCE AT MEDIUM AND HIGH FLIGHT LEVELS **c20**
S. G. Cornford *In* AGARD Flight in Turbulence Nov. 1973 14 p refs (For availability see N74-17720 09-02)

The characteristics of atmospheric turbulence at medium and high flight levels are discussed. Emphasis is placed on research on turbulence in clear air away from mountains and local storms and in clear air near storm tops. Estimates on the likelihood of encountering cloud and precipitation at the cruising levels of supersonic transport aircraft. Numerical forecasting techniques for atmospheric turbulence are reported. Author

N74-17722* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROBLEMS IN THE SIMULATION OF ATMOSPHERIC BOUNDARY LAYER FLOWS **c20**
George H. Fichtl *In* AGARD Flight in Turbulence Nov. 1973 14 p refs (For availability see N74-17720 09-02)

The realistic simulation of flow in the atmospheric boundary layers at heights greater than two kilometers is discussed. Information concerning horizontally homogeneous and statistically stationary atmospheric boundary layer flows is presented. The problems related to the incorporation of the information into atmospheric wind simulation programs are analyzed. The information which the meteorologist must acquire in order to provide a basis for improving the simulation of atmospheric boundary flows is explained. Author

N74-17723 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
TURBULENCE AND MESOSCALE HORIZONTAL TEMPERATURE GRADIENTS IN THE LOWER STRATOSPHERE **c20**
Ian MacPherson *In* AGARD Flight in Turbulence Nov. 1973 15 p refs (For availability see N74-17720 09-02)

Data are presented on the frequencies of occurrence of turbulence and significant horizontal temperature gradients along with their dependence on altitude, season, underlying terrain, geographical location, and jet stream position. These factors are important both in the forecast problem and in the comparison of these results with those of other observing programs. Specific examples of encounters with atmospheric turbulence during the course of a research project on atmospheric instability are provided. Author

N74-17724 Tennessee Univ. Space Inst., Tullahoma.
REVIEW OF DATA AND PREDICTION TECHNIQUES FOR WIND PROFILES AROUND MANMADE SURFACE OB-

STRUCTIONS c20
Walter Frost *In* AGARD Flight in Turbulence Nov. 1973 18 p refs (For availability see N74-17720 09-02)
(Contract NAS8-27387)

A review of experimental data and analytical models related to flow over bluff obstacles is presented to provide a survey of basic flow theory available to analyze atmospheric wind patterns and man-made surface obstructions. Primary emphasis is placed on the distortion of shear flows approaching and passing over buildings or bluff surfaces such as fences or steps. The various physical phenomena of pressure and velocity variation in the separated flow regions surrounding the body, velocity profiles in the displaced flow over the body, and the origin and decay of induced turbulence along the boundaries of the separated regions are described. Author

N74-17725 Delft Univ. of Technology (Netherlands). Dept. of Aeronautical Engineering.
PROGRESS IN THE MATHEMATICAL MODELLING OF FLIGHT IN TURBULENCE
O. H. Gerlach, G. A. J. VandeMoesdijk, and J. C. VanderVaart *In* AGARD Flight in Turbulence Nov. 1973 38 p refs (For availability see N74-17720 09-02)

Problems of mathematical modelling of aircraft flight in turbulence are discussed. The simulation of flight in the lower atmosphere during the approach and landing portions of the flight are emphasized. The discrepancy between the usual Gaussian representation of atmospheric turbulence and the actual non-Gaussian atmosphere is analyzed. A parameter is introduced to characterize the actual turbulence sensed by the pilot. A method is presented for finding the range of altitudes at which the most significant disturbances are encountered during the approach. Author

N74-17726 British Overseas Airways Corp., London (England).
BOAC EXPERIENCE WITH TURBULENCE
Ernest Chambers *In* AGARD Flight in Turbulence Nov. 1973 13 p (For availability see N74-17720 09-02)

The effectiveness of airborne radar in giving adequate warning of convective turbulence in clouds is discussed. Some encounters with turbulence in clear air are described and matters relating to the forecasting, reporting, and dissemination of turbulence occurence are presented. The development of an airborne clear air turbulence detector is recommended and the performance requirements of the detector are developed. Problems with low level wind shear are also examined. Author

N74-17727 Deutsche Lufthansa Aktiengesellschaft, Frankfurt am Main (West Germany). Meteorological Dept.
AN AIRLINE'S EXPERIENCE ON TURBULENCE
Heinz Dreyling *In* AGARD Flight in Turbulence Nov. 1973 7 p (For availability see N74-17720 09-02)

A compilation of the replies of airline pilots to a questionnaire on different areas concerned with atmospheric turbulence is presented. An assessment is made on flight times in turbulence, strength and type of turbulence, and the potential effect of turbulence on airline operations. Specific geographical areas as well as airports with specific turbulence encounters are listed, and potential energy sources are mentioned. The turbulence penetration speed is discussed as well as means to avoid turbulent encounters or to alleviate turbulent conditions through air traffic control, meteorological reports, or pilot experience. Author

N74-17728 Royal Aircraft Establishment, Farnborough (England).
INFLUENCE OF PILOT AND AIRCRAFT CHARACTERISTICS ON STRUCTURAL LOADS IN OPERATIONAL FLIGHT
J. R. Sturgeon *In* AGARD Flight in Turbulence Nov. 1973 24 p refs Presented at the 35th Meeting of the Struct. and Mater. Panel, Toulouse, France, 24-29 Sep. 1972 (For availability see N74-17720 09-02)
(AGARD-608)

Some aircraft handling problems met in operational conditions are described and compared with flight test conditions. It is concluded that errors in flight instrumentation and physiological cues have a substantial influence on control capability. A procedure for minimizing structural loads and aerodynamic problems in all flight conditions is proposed. The procedure will restore to the pilot and to the autopilot controlled flying the positive stability in pitch and yaw which is required for aircraft operating in the stick free mode. Proposals are made for improving the requirements of flight instruments to reduce control problems during complex maneuvers and flight in severe wind shear conditions. Author

N74-17729 British Aircraft Corp., Warton (England). Military Aircraft Div.
AIRCRAFT RESPONSE TO TURBULENCE-CREW COMFORT ASSESSMENTS USING POWER SPECTRAL DENSITY METHODS
Brian Young *In* AGARD Flight in Turbulence Nov. 1973 9 p refs (For availability see N74-17720 09-02)

The effects of atmospheric turbulence on the efficiency of a flight crew are analyzed. The factors are identified as: (1) atmospheric turbulence levels, (2) the characteristics of the aircraft in responding to turbulence, including the effects of structural modes, and (3) the tolerance of the crew to the level and duration of vibration at the crew station. The use of power spectral density techniques for assessing crew ride comfort is explained. In addition to defining aircraft response in both vertical and lateral turbulence, it is possible to include the effects of structural modes, assess the effects of autostabilization, and include crew proficiency degradation as a parameter in operational studies. Author

N74-17730 Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).
THE EFFECT OF GUSTS AND WIND SHEAR FOR AUTOMATIC STOL APPROACH AND LANDING
Gunther Schaenzer *In* AGARD Flight in Turbulence Nov. 1973 17 p refs (For availability see N74-17720 09-02)

The characteristics of a flight control system for short takeoff aircraft are discussed. The system is used during steep and curved approaches. The system was simulated and flight tested during more than 500 automatic STOL approaches and landings. The effects of gusts and wind shear, especially at extremely low indicated airspeads during approach and flare, with respect to the pilot's workloads, passenger comfort, throttle activity, angle of attack measurement, and precision in approach and landing are analyzed. Author

N74-17731 Transportation Systems Center, Cambridge, Mass.
THE DETECTION OF AIRCRAFT WAKE VORTICES
Ralph D. Kodis *In* AGARD Flight in Turbulence Nov. 1973 9 p refs (For availability see N74-17720 09-02)

The hazards created by the trailing vortices deposited in the wakes of heavy jet aircraft are discussed. In the terminal area this hazard leads to longer separation standards and reduced runway capacity. In order to shorten the required separations without compromising safety it is necessary to be able to detect the presence and motion of vortices in regions where they constitute a threat. The sensing techniques that have been developed are reported. The characteristics of acoustic and wind pressure sensors for detecting vortices are described. Author

N74-17732 Federal Aviation Administration, Washington, D.C. Office of Systems Engineering Management.
WAKE VORTEX AVOIDANCE SYSTEM PROGRAM (WVAS)
Lawrence Langweil *In* AGARD Flight in Turbulence Nov. 1973 9 p refs (For availability see N74-17720 09-02)

A wake vortex avoidance system (WVAS) program is described. The objective of the program is to design and implement a ground based monitoring and predictive system at airports which will increase runway capacity by eliminating the need for larger separations between aircraft for safety from wake vortices. The program consists of three major tasks: (1) sensor development, (2) vortex behavior characterization and hazard definition, and (3) integration of these tasks into an overall system design. The meteorological factors which affect the performance of the proposed system are analyzed. Author

N74-17733* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VORTEX WAKE RESEARCH
John A. Zalovcik and R. Earl Dunham, Jr. *In* AGARD Flight in Turbulence Nov. 1973 14 p refs (For availability see N74-17720

09-02)

NASA investigations of aircraft trailing vortices are reviewed. Results obtained in flight on vortex characteristics, such as decay of maximum velocity and vortex drift, are presented for distances behind a generating C-5 aircraft from 0.6 to 13.0 nautical miles. The lateral control activity of a CV-990 aircraft probing the vortices generated by the C-5 aircraft is illustrated and the effect of the C-5 aircraft configuration on this activity is indicated. Results are presented from near-field and far-field studies of accelerated vortex dissipation through the use of various devices such as mass ejection, spoilers, vortex generators, and trailing drag devices. Author

N74-17734 Aeronautical Research Associates of Princeton, Inc., N.J.

ON TURBULENCE ENVIRONMENT AND DESIGN CRITERIA

John C. Houbolt *In* AGARD Flight in Turbulence Nov. 1973 15 p refs (For availability see N74-17720 09-02)

Aircraft design criteria based on the effects of atmospheric turbulence are discussed. Emphasis is placed on the power spectral techniques, but equivalences to the discrete-gust procedure are shown. Consideration is given to large design loads, such as limit load and to repeated loads which affect structural fatigue. Mathematical models are provided to illustrate the gust design approaches and the basic spectral procedure. Author

N74-17735 NATO MRCA Development and Production Management Agency, Munich (West Germany).

DESIGN PROBLEMS OF MILITARY AIRCRAFT AS AFFECTED BY TURBULENCE

M. Hacklinger *In* AGARD Flight in Turbulence Nov. 1973 9 p ref (For availability see N74-17720 09-02)

The influence of atmospheric turbulence on the design of military aircraft is analyzed. The subject is treated in two main categories: (1) turbulence as a sizing factor in itself which determines static and fatigue strength of major parts of low load factor aircraft and (2) turbulence as an important design parameter of high load factor aircraft where stability of the augmented aircraft in manual or automatic terrain following flight, pilot proficiency under vibration, and the attitude accuracy of the aircraft as a weapons platform become important. The problem of designing for proper flight qualities in high speed tactical fighter missions is described with emphasis on analytical prediction of pilot task proficiency under the vibration environment created by airframe and flight control system characteristics. Author

N74-17736 Messerschmitt-Boelkow G.m.b.H., Ottobrunn (West Germany).

INFLUENCE OF TURBULENCE ON HELICOPTER DESIGN AND OPERATION

G. Reichert and M. Rade *In* AGARD Flight in Turbulence Nov. 1973 16 p refs (For availability see N74-17720 09-02)

The sensitivity of the helicopter to atmospheric turbulence because of the relatively low disc loading is discussed. The influences of other parameters such as rotor stiffness and damping are analyzed. The effects of these influences on different helicopters are compared. The main design problems of meeting operational and certification requirements and methods for improving the performance of helicopters are examined. Author

N74-17737 De Havilland Aircraft Co., Ltd., Downsview (Ontario).

DATA REQUIREMENTS ON TURBULENCE IN THE EARTH'S ATMOSPHERIC SHEAR LAYER FOR STOL DESIGN CRITERIA

J. J. Glaser *In* AGARD Flight in Turbulence Nov. 1973 8 p refs (For availability see N74-17720 09-02)

The factors which affect the airworthiness of short takeoff aircraft, especially during the landing and takeoff phase of the operation. Atmospheric turbulence is one of the most important factors affecting aircraft behavior at low altitudes, and its description in terms of a realistic model is an essential step in the design, certification, and operation of STOL aircraft. A study to devise a low altitude gust model and to determine the relative importance of the gust model parameters of the responses of typical STOL aircraft was conducted. The significant features of the DHC-3 aircraft which was used in the test are analyzed. Author

N74-17738 Hawker Siddeley Aviation, Ltd., Hatfield (England).

EXPERIENCE WITH A LOW ALTITUDE TURBULENCE MODEL FOR AUTOLAND CERTIFICATION

R. M. P. McManus *In* AGARD Flight in Turbulence Nov. 1973 8 p ref (For availability see N74-17720 09-02)

The effects of atmospheric turbulence on the autoland system of the Trident aircraft are discussed. The aircraft was instrumented to obtain three axis gust time histories for each landing made. From these time histories a gust model was built up and was used for the initial certification of the automatic landing system. The results obtained with the gust model are compared with the statistical analysis of flight test data to determine the degree of correlation. Author

N74-17739 British Aircraft Corp., Weybridge (England). Commercial Aircraft Div.

STRUCTURAL LOADS AND GUST CRITERIA

D. O. N. James *In* AGARD Flight in Turbulence Nov. 1973 13 p refs (For availability see N74-17720 09-02)

The effects of atmospheric turbulence on aircraft design criteria are analyzed. The discrete gust methods are compared with the power spectral density methods to determine the degree of application to aircraft gust load problems. The application of continuous turbulence design procedure was investigated. Mission analysis results are shown to be very sensitive to the assumed operating technique. Graphs of specific aircraft design envelope limit loads against the discrete gust load limit are provided. Author

N74-17740 Royal Netherlands Aircraft Factories Fokker, Amsterdam.

RATIONAL CALCULATION OF DESIGN GUST LOADS IN RELATION TO PRESENT AND PROPOSED AIRWORTHINESS REQUIREMENTS

J. Yff *In* AGARD Flight in Turbulence Nov. 1973 11 p refs (For availability see N74-17720 09-02)

An analysis of accurately calculated gust loads for three short haul aircraft was conducted. The results are applied to the following conditions: (1) comparison of power spectral density and discrete gust methods, (2) comparison of power spectral density mission analysis and design envelope results, (3) comparison of power spectral density results for vertical and lateral gusts, and (4) a study of the specific problems of T-tail configurations. Graphs of load conditions for various aircraft components are provided. Author

N74-17741 British Aircraft Corp., Warton (England). Military Aircraft Div.

C.S.A.S. DESIGN FOR GOOD HANDLING IN TURBULENCE

A. G. Barnes *In* AGARD Flight in Turbulence Nov. 1973 14 p refs (For availability see N74-17720 09-02)

The design objectives for aircraft control and stability augmentation systems are discussed with respect to the effects of atmospheric turbulence. The subjects presented include the following: (1) handling qualities requirements for flight in turbulence, (2) performance of unaugmented aircraft in turbulence, (3) performance of augmented aircraft in turbulence, and (4) approaches to stability augmentation systems development. Specific emphasis is placed on the aircraft parameters of planform, excitation derivatives, control power, and aircraft size. Author

N74-17742* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

THEORETICAL HORIZONTAL TAIL LOADS AND ASSOCIATED AIRCRAFT RESPONSES OF AN AUTOPILOT-CONTROLLED JET TRANSPORT FLYING IN TURBULENCE

Boyd Perry, III and Kermit G. Pratt *In* AGARD Flight in Turbulence Nov. 1973 9 p refs (For availability see N74-17720 09-02)

An exploratory analytical study was conducted to analyze problem areas associated with a rigid aircraft controlled by a simple autopilot. The aircraft motion is constrained to the longitudinal phugoid and short period modes. The autopilot

characteristics are described. The analytical procedure is explained and stabilizer loads together with some aircraft motions as functions of autopilot gains within the stability boundaries are determined. The effects of center of gravity location and altitude are considered. Author

N74-17743 Royal Aircraft Establishment, Farnborough (England). Avionics Dept.

THE DESIGN OF AUTOMATIC FLIGHT CONTROL SYSTEMS TO REDUCE THE EFFECTS OF ATMOSPHERIC DISTURBANCES

M. J. Corbin and K. F. Goddard *In* AGARD Flight in Turbulence Nov. 1973 16 p refs (For availability see N74-17720 09-02)

The design of two experimental automatic flight control systems for the BAC 111 aircraft is described. One system used throttle and elevator controls and the other uses, in addition, direct lift control by means of spoilers. The landing performance of the systems is compared with conventional automatic landing systems. It is stated that discrete gusts experienced at heights below 15 meters can produce large touchdown errors exceeding the capability of the autopilot control. Author

N74-17744 Royal Aircraft Establishment, Bedford (England). Aero Flight Div.

APPLICATION OF ENERGY MANAGEMENT CONCEPTS TO FLIGHT-PATH CONTROL IN TURBULENCE

J. G. Jones *In* AGARD Flight in Turbulence Nov. 1973 18 p refs (For availability see N74-17720 09-02)

Some effects of turbulence on aircraft flight path control are reviewed. An outline is presented of a strategy for the control of airspeed and flight path of an aircraft, based on the use of the throttle to control total energy error, consisting of a kinetic component associated with airspeed and a potential component associated with height, and the elevator used to distribute the energy error between airspeed and height in an optimum manner. Emphasis is placed on the flight path control in a landing approach. The safety aspects of an aircraft subjected to large gust disturbances are also considered. Author

N74-17745 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

A NEW APPROACH TO GUST ALLEVIATION OF A FLEXIBLE AIRCRAFT USING AN OPEN LOOP DEVICE

Pierre-Marie Hutin *In* AGARD Flight in Turbulence Nov. 1973 9 p ref In FRENCH; ENGLISH Summary (For availability see N74-17720 09-02)

The application of optimization techniques for the purpose of gust alleviation is discussed. The basic approach is an extension of the Wiener's optimization theory to two control parameters and the application to the Caravelle aircraft. A comparison is made between the theoretical responses to a Gaussian stationary excitation and the responses to actual records of turbulence given by an analong computer taking into account the nonlinearities due to limited efficiency of the controls. Author

N74-17746 Royal Aircraft Establishment, Bedford (England).

SOME COMMENTS ON METHODS OF AVOIDING THE EFFECTS OF TURBULENCE

A. McPherson *In* AGARD Flight in Turbulence Nov. 1973 11 p refs (For availability see N74-17720 09-02)

The characteristics of airborne detectors for warning of the presence of clear air turbulence are discussed. The turbulence problem and the effects of atmospheric turbulence on aircraft performance are analyzed. The specific applications of infrared radiometer and Doppler lidar techniques are explained. Author

N74-17747*# Scientific Translation Service, Santa Barbara, Calif.

EXPERIMENTAL STUDY OF A WING PROFILE WITH FOWLER FLAPS AND SLATS

J. Barche Washington NASA Mar. 1974 38 p refs Transl. into ENGLISH from DFVLR Papers on Fluid Dyn. with Emphasis on Boundary Layer Theory, Pt. 1 (West Germany), 9 Mar. 1973 p 7-44

(Contract NASw-2483)

(NASA-TT-F-15370; N73-33187) Avail: NTIS HC $5.00 CSCL 01A

Usually high lift aids for aircraft are examined on scale-down models. The application of this experimental data is problematical. There is a basic interest in establishing a theory for the flow conditions over the flap system during takeoff and landing. The present experimental study attempts to provide the basis for future theoretical models based on detailed measurements over a simple profile which has Fowler flaps and slats. Author

N74-17748# National Transportation Safety Board, Washington, D.C.

AIRCRAFT ACCIDENT REPORT: OVERSEAS NATIONAL AIRWAYS, INC., MCDONNELL DOUGLAS, DC-8-63, N863F, BANGOR, MAINE, 20 JUNE 1973

7 Feb. 1974 13 p

(NTSB-AAR-74-1) Avail: NTIS HC $4.00

A DC-8-63 en route from Tampa, Florida, to Geneva, Switzerland, via Bangor, Maine, and Amsterdam, the Netherlands, was involved in a takeoff accident at the Bangor International Airport, Bangor, Maine, on June 20, 1973. In the emergency evacuation that followed, 34 of the 251 passengers on board were injured. During the takeoff roll, the captain heard a loud, muffled sound, like that of a blown tire, and discontinued the takeoff. A fire broke out in the right main landing gear assembly and right wing root area. The passengers and crew emerged via the airplane emergency escape chute system. The probable cause of the accident was the undetected deflation of a right main landing gear tire as the aircraft was taxiing for takeoff. The additional loads imposed upon two other tires caused them to fail during the takeoff roll. Subsequently, the wheel assemblies were damaged. The fire was ignited by the friction between the metal wheels and the runway pavement. Author

N74-17749*# Boeing Commercial Airplane Co., Seattle, Wash.

APPLICABILITY OF NASA (ARC) TWO-SEGMENT APPROACH PROCEDURES TO BOEING AIRCRAFT

Robert L. Allison Jan. 1974 51 p refs

(Contract NAS2-7561)

(NASA-CR-114678; D6-41336) Avail: NTIS HC $5.75 CSCL 01C

An engineering study to determine the feasibility of applying the NASA (ARC) two-segment approach procedures and avionics to the Boeing fleet of commercial jet transports is presented. This feasibility study is concerned with the speed/path control and systems compability aspects of the procedures. Path performance data are provided for representative Boeing 707/727/737/747 passenger models. Thrust margin requirements for speed/path control are analyzed for still air and shearing tailwind conditions. Certification of the two-segment equipment and possible effects on existing airplane certification are discussed. Operational restrictions on use of the procedures with current autothrottles and in icing or reported tailwind conditions are recommended. Using the NASA/UAL 727 procedures as a baseline, maximum upper glide slopes for representative 707/727/737/747 models are defined as a starting point for further study and/or flight evaluation programs. Author

N74-17750*# Boeing Commercial Airplane Co., Seattle, Wash.

HIGH TRANSONIC SPEED TRANSPORT AIRCRAFT STUDY Final Report, Jun. 1972-May 1973

Robert M. Kulfan, Frank D. Neumann, James W. Nisbet, Alan R. Mulally, James K. Murakami, Elias C. Noble, John P. McBarron, James L. Stalter, David W. Gimmestad, and Mark B. Sussman Sep. 1973 205 p refs

(Contract NAS2-7031)

(NASA-CR-114658) Avail: NTIS HC $13.25 CSCL 01C

An initial design study of high-transonic-speed transport aircraft has been completed. Five different design concepts were developed. These included fixed swept wing, variable-sweep wing, delta wing, double-fuselage yawed-wing, and single-fuselage yawed-wing aircraft. The boomless supersonic design objectives of range = 5560 Km (3000 nmi), payload-18 143 kg (40 000lb), Mach = 1.2, and FAR Part 36 aircraft noise levels were achieved by the single-fuselage yawed-wing configuration with a gross weight of 211 828 Kg (467 000 lb). A noise level of 15 EPNdB below FAR Part 36 requirements was obtained with a gross weight increase to 226 796 Kg (500 000 lb). Although wing aeroelastic divergence was a primary design consideration for the yawed-wing concepts, the graphite-epoxy wings of this study were designed by critical gust and maneuver loads rather than

by divergence requirements. The transonic nacelle drag is shown to be very sensitive to the nacelle installation. A six-degree-of-freedom dynamic stability analysis indicated that the control coordination and stability augmentation system would require more development than for a symmetrical airplane but is entirely feasible. A three-phase development plan is recommended to establish the full potential of the yawed-wing concept. Author

N74-17751*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN INTEGRATION AND NOISE STUDIES FOR JET STOL AIRCRAFT. TASK 7A: AUGMENTOR WING CRUISE BLOWING VALVELESS SYSTEM. VOLUME 1: SYSTEM DESIGN AND TEST INTEGRATION
F. A. Roepcke and T. B. Nickson Apr. 1973 47 p refs
(Contract NAS2-6344)
(NASA-CR-114621; D6-40950-Vol-1) Avail: NTIS HC $5.50 CSCL 01C

Exploratory design studies conducted to establish the configuration of an augmentor wing cruise blowing (valveless) system in a 150-passenger STOL airplane were reported in NASA CR-114570. Those studies have been updated to incorporate the results of static rig, flow duct, and wind tunnel tests. Minor adjustments in duct flow velocity, flap length, and blowing nozzle geometry were incorporated to provide airplane characteristics that minimize takeoff gross weight and achieve sideline noise objectives for an advanced commercial STOL airplane. Author

N74-17752*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN INTEGRATION AND NOISE STUDIES FOR JET STOL AIRCRAFT. TASK 7C: AUGMENTOR WING CRUISE BLOWING VALVELESS SYSTEM. VOLUME 1: STATIC TESTING OF AUGMENTOR NOISE AND PERFORMANCE
J. M. Campbell, D. L. Harkonen, and J. V. OKeefe Nov. 1973 45 p refs
(Contract NAS2-6344)
(NASA-CR-114622; D6-41216-Vol-1) Avail: NTIS HC $5.25 CSCL 01C

Static performance and acoustic tests were conducted on a two-dimensional one-third-scale augmentor flap model that simulated a cruise blowing augmentor system designed for a scale augmentor flap model that simulated a cruise blowing augmentor, which offers a degree of 150-passenger STOL airplane. The cruise blowing augmentor, which offers a degree of simplicity by requiring no fan air diverter valves, was simulated by fitting existing lobe suppressor nozzles with new nozzle fairings. Flow turning performance of the cruise blowing augmentor was measured through a large range of flap deflection angles. The noise suppression characteristics of a multilayer acoustic lining installed in the augmentor were also measured. Author

N74-17753*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN INTEGRATION AND NOISE STUDIES FOR JET STOL AIRCRAFT. TASK 7C: AUGMENTOR WING CRUISE BLOWING VALVELESS SYSTEM. VOLUME 2: SMALL-SCALE DEVELOPMENT TESTING OF AUGMENTOR WING CRITICAL DUCTING COMPONENTS
J. N. Runnels and A. Gupfa Nov. 1973 77 p refs
(Contract NAS2-6344)
(NASA-CR-114623; D6-40879-Vol-2) Avail: NTIS HC $7.00 CSCL 01C

Augmentor wing ducting system studies conducted on a valveless system configuration that provides cruise thrust from the augmentor nozzles have shown that most of the duct system pressure loss would occur in the strut-wing duct y-junction and the wing duct-augmentor lobe nozzles. These components were selected for development testing over a range of duct Mach numbers and pressure ratios to provide a technical basis for predicting installed wing thrust loading and for evaluating design wing loading of a particular wing aspect ratios. The flow characteristics of ducting components with relatively high pressure loss coefficients were investigated. The turbulent pressure fluctuations associated with flows at high Mach numbers were analyzed to evaluate potential duct fatigue problems. Author

N74-17754*# National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
METHODS AND COSTS ASSOCIATED WITH OUTFITTING LIGHT AIRCRAFT FOR REMOTE SENSING APPLICATIONS
O. L. Rhodes and E. F. Zetka 4 Jul. 1973 73 p
(NASA-TM-X-69938; ERL-076) Avail: NTIS HC $6.75 CSCL 01C

This document was designed to provide the potential user of a light aircraft remote sensor platform/data gathering system with general information on aircraft definition, implementation complexity, costs, scheduling and operational factors involved in this type of activity. Most of the subject material was developed from actual situations and problem areas encountered during the build-up cycle and early phases of flight operations. Author

N74-17755*# Boeing Commercial Airplane Co., Seattle, Wash.
A 727 AIRPLANE CENTER DUCT INLET LOW SPEED PERFORMANCE CONFIRMATION MODEL TEST FOR REFANNED JT8D ENGINES, PHASE 2
G. Kaldschmidt, B. E. Syltebo, and C. T. Ting Nov. 1973 135 p refs
(Contract NAS3-17842)
(NASA-CR-134534; D6-41513) Avail: NTIS HC $9.75 CSCL 01C

The results from testing of a 0.3 scale model center duct inlet (S duct) for the Pratt and Whitney Aircraft JT8D-100 engines are presented. The objective of this test was to demonstrate that the required airflow of the JT8D-100 engine (480 lb/sec as compared to 334 lb/sec for JT8D-15) can be achieved with minimum modifications to the existing 727 airplane structure at acceptable levels of total pressure recovery and distortion. Steady-state pressure recovery, steady-state pressure distortion, and dynamic pressure measurements were taken at the engine face station. Surface static pressure measurements were taken along the duct. Test results indicated that the required airflow was achieved with acceptable pressure recovery (comparable to the current 727-200 S duct). Inlet inflow angle variation within the 727 airplane operating regime (minus 5 to 5 degrees) had no effect on the inlet performance. Pressure distortion at static and forward speed at takeoff airflow conditions are within P and WA limits for the Phase II duct when equipped with vortex generators. Static crosswind operation between 10 knots and 25 knots appears feasible at full takeoff power. Author

N74-17756*# Tennessee Univ. Space Inst., Tullahoma.
NOISE CHARACTERISTICS OF JET FLAP TYPE EXHAUST FLOWS Final Report
G. O. Schrecker and J. R. Maus Washington NASA Feb. 1974 135 p refs
(Grant NGR-43-001-075)
(NASA-CR-2342) Avail: NTIS HC $4.75 CSCL 20A

An experimental investigation of the aerodynamic noise and flow field characteristics of internal-flow jet-augmented flap configurations (abbreviated by the term jet flap throughout the study) is presented. The first part is a parametric study of the influence of the Mach number (subsonic range only), the slot nozzle aspect ratio and the flap length on the overall radiated sound power and the spectral composition of the jet noise, as measured in a reverberation chamber. In the second part, mean and fluctuating velocity profiles, spectra of the fluctuating velocity and space correlograms were measured in the flow field of jet flaps by means of hot-wire anemometry. Using an expression derived by Lilley, an attempt was made to estimate the overall sound power radiated by the free mixing region that originates at the orifice of the slot nozzle (primary mixing region) relative to the overall sound power generated by the free mixing region that originates at the trailing edge of the flap (secondary mixing region). It is concluded that at least as much noise is generated in the secondary mixing region as in the primary mixing region. Furthermore, the noise generation of the primary mixing region appears to be unaffected by the presence of a flap. Author

N74-17757*# Scientific Translation Service, Santa Barbara, Calif.
IMPROVEMENT OF MANEUVERABILITY AT HIGH SUBSONIC SPEEDS
W. Staudacher Washington NASA Mar. 1974 21 p refs
Transl. into ENGLISH from the German report UFE-896-72
(Contract NASw-2483)
(NASA-TT-F-15406; UFE-896-72) Avail: NTIS HC $4.25 CSCL

01C

Results of a series of experimental studies regarding the improvement of the maneuverability of fighter aircraft. The applicability of slotted and unslotted leading edge and trailing edge flaps was tested up to the transonic region on a wind tunnel model as a geometrically variable configuration variant. As a geometrically fixed configuration variant, strakes, or high sweepback leading edge modifications, were attached to the basic delta wing at the wing root and were tested in the entire Mach number range of a fighter aircraft. Through a combination of the maneuver aids improvements of more than 100% over the basic wing could be achieved in certain flight ranges. The efficiency of the strake in the range of high angles of attack considerably exceeds that of the flap system. Author

N74-17758*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

WIND TUNNEL INVESTIGATION OF SIMULATED HELICOPTER ENGINE EXHAUST INTERACTING WITH WINDSTREAM

Craig S. Shaw and John C. Wilson Washington Mar. 1974 36 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Hampton, Va. Film Supplement Number L-1139 to this report is available on request from NASA. Langley Res. Center Attn: Photographic Branch, Mail Stop 171, Hampton, Va. 23665

(NASA-TM-X-3016; L-9430) Avail: NTIS HC $3.25 CSCL 01C

A wind tunnel investigation of the windstream-engine exhaust flow interaction on a light observation helicopter model has been conducted in the Langley V/STOL tunnel. The investigation utilized flow visualization techniques to determine the cause to determine the cause of exhaust shield overheating during cruise and to find a means of eliminating the problem. Exhaust flow attachment to the exhaust shield during cruise was found to cause the overheating. Several flow-altering devices were evaluated to find a suitable way to correct the problem. A flow deflector located on the model cowling upstream of the exhaust in addition to aerodynamic shield fairings provided the best solution. Also evaluated was heat transfer concept employing pin fins to cool future exhaust hardware. The primary flow visualization technique used in the investigation was a newly developed system employing neutrally buoyant helium-filled bubbles. The resultant flow patterns were recorded on motion picture film and on television magnetic tape. Author

N74-17759*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

COMPUTED LATERAL POWER SPECTRAL DENSITY RESPONSE OF CONVENTIONAL AND STOL AIRPLANES TO RANDOM ATMOSPHERIC TURBULENCE

Jacob H. Lichtenstein Washington Mar. 1974 90 p refs

(NASA-TN-D-7444; L-9035) Avail: NTIS HC $4.00 CSCL 01C

A method of computing the power spectral densities of the lateral response of airplanes to random atmospheric turbulence was adapted to an electronic digital computer. By use of this program, the power spectral densities of the lateral roll, yaw, and sideslip angular displacement of several conventional and STOL airplanes were computed. The results show that for the conventional airplanes, the roll response is more prominent than that for yaw or sideslip response. For the STOL airplanes, on the other hand, the yaw and sideslip responses were larger than the roll response. The response frequency of the STOL airplanes generally is higher than that for the conventional airplanes. This combination of greater sensitivity of the STOL airplanes in yaw and sideslip and the frequency at which they occur could be a factor causing the poor riding qualities of this class of airplanes. Author

N74-17760# Centre d'Essai Aeronautique, Toulouse (France).

LABORATORY SIMULATION OF KINETIC HEATING EFFECTS ON THE STRUCTURE OF CONCORDE AIRCRAFT [RESTITUTION EN LABORATOIRE DES EFFETS DE L'ECHAUFFEMENT C INETIQUE SUR LA STRUCTURE DE L'AVION CONCORDE]

M. Perrais 1973 18 p In FRENCH Presented at the Intern. Colloq. Simulation and Space, Toulouse, 10-14 Sep. 1973

Avail: NTIS HC $4.00

The kinetic heating effects on the Concorde aircraft structure were simulated by means of an infrared radiation facility. The simulation of convection flux effects by radiation flux poses a problem in that the radiation flux is practically unaffected by surface temperature, whereas the convection flux is. The radiation flux is therefore adapted to the surface as a function of the required temperature by subdividing the surface in heating zones on which a group of IR tubes radiates equal fluxes at given moments. For the Concorde structure 150 such groups were utilized. The thermal stress results obtained were compared to inflight stresses, and good concordance was found. ESRO

N74-17761# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

TWO DIMENSIONAL AIR CUSHION LANDING SYSTEM PERIPHERAL JET CONFIRMATION STUDY M.S. Thesis - AF Inst. of Tech.

John R. Rogers Sep. 1973 101 p refs

(AF Proj. 1369)

(AD-771616; GAM/AE/73-13; AFFDL-TR-73-5) Avail: NTIS CSCL 01/3

A simplified two-dimensional peripheral jet theory for the equilibrium performance of an air cushion vehicle is investigated. The proposed theory intends to yield a rapid prediction of the actual flow rate and actual power requirements for an air cushion landing system in the hover condition. Nine specific nozzle configurations were tested to determine which resulted in the best power-height performance and whether the theory is able to predict the experimental performance. Three single peripheral jet configurations were tested at a trunk pressure of 80 psfg. Six distributed jet configurations were tested at a trunk pressure of 40 psfg. Effects of inward flow injection angles of 30 degrees and 60 degrees were investigated. (Modified author abstract) GRA

N74-17762# Human Factors Research, Inc., Goleta, Calif.

COLOR PERCEPTION IN THE TRANSITIONAL ZONES OF TRICOLOR GLIDE-SLOPE INDICATORS (GSI'S) Technical Report, 29 Jun. - 29 Nov. 1973

Robert T. Hennessy and Gail J. Borden Nov. 1973 66 p refs (Contract N00156-73-C-1008)

(AD-771422; Rept-1751) Avail: NTIS CSCL 01/2

The report describes an investigation of color perception in the transitional zones of tricolor glide-slope indicators (GSI's) designed to aid helicopter night approaches to non-aviation ships. In GSI's with colors arranged, from top to bottom, yellow, green, red (YGR), an anomalous yellow or white appears in the transitional zones between the green and red color regions. This anomalous color can be misinterpreted as a too high signal and lead to a potentially hazardous descent maneuver. It was experimentally determined that the anomalous color zone occurs over an angular extent of at least .319 degrees in the GSI unit tested. (Modified author abstract) GRA

N74-17763# Army Aviation Systems Test Activity, Edwards AFB, Calif.

INSTRUMENTATION SPECIFICATION FOR CLIMATIC LABORATORY TESTS

Kenneth R. Ferrell and Thomas L. Lynch Aug. 1973 10 p

(AD-771053; USAASTA-73-41) Avail: NTIS CSCL 01/3

The specification defines the test instrumentation requirements for Climatic Laboratory tests conducted by the United States Army Aviation Systems Test Activity (USAASTA). This document is intended to provide guidance to contractors and activities that are required to instrument and support Climatic Laboratory tests conducted at Eglin Air Force Base, Florida. GRA

N74-17764# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.

DYNAMIC MODEL WIND TUNNEL TESTS OF A VARIABLE-DIAMETER, TELESCOPING-BLADE ROTOR SYSTEM (TRAC ROTOR)

Evan A. Fradenburgh, Robert J. Murrill, and Edmond F. Kiely Jul. 1973 217 p refs

(Contract DAAJ02-68-C-0074; DA Proj. 1F1-62204-A-139)

(AD-771037; SER-50797; USAAMRDL-TR-73-32) Avail: NTIS CSCL 01/3

An analytical and experimental program was conducted to establish feasibility and determine characteristics of the Sikorsky TRAC rotor system, which is a unique variable-diameter, telescoping-blade concept for advanced rotary-wing aircraft. The program included a preliminary design study of a full-scale blade, wind tunnel tests of a dynamically scaled rotor model in various flight modes, and correlation of experimental results with theory. Feasibility was established for the TRAC rotor operating both as a high-speed compound helicopter and as a stopped/stowed rotor configuration. The basic blade structural design and the retraction system were verified with the model, which was scaled for operation at full tip speeds and forward speeds. (Modified author abstract) GRA

N74-17765# AiResearch Mfg. Co., Torrance, Calif.
MECHANICAL COMPONENT FAILURE PROGNOSIS STUDY Final Report
Hans K. Ziebarth, Jee-Da Chang, and Joseph Kukel Jun. 1973 103 p refs
(Contract DAAJ02-71-C-0049; DA Proj. 1F1-62203-A-434)
(AD-771033; Rept-72-8745; USAAMRDL-TR-73-26) Avail: NTIS CSCL 01/3

The report presents the results of a study of failure prognosis of mechanical components of propulsive transmissions and gearboxes of Army aircraft. The step from on-line determination of component current mechanical condition by inferential, or diagnostic, methods to condition prognosis appears feasible if diagnostic techniques of the signature-composite interpretive type are used and diagnostic information is blended with inputs from the areas of component design theory, tribology, system abnormal physiology, and life predictive theory. For current component status determination, use of dynamic and lubricant-carried particle content signatures was found to be of greatest value. Use of the composite exceedance method in the dynamic data interpretation area and use of statistical methods recently developed in fluid-borne particle metrology in the lubricant particle content area would be indicated for attaining prognostic objectives. Author (GRA)

N74-17766# Ketron, Inc., Wayne, Pa.
INTEGRATED MAINTENANCE AND READINESS DATA PROCESSING FOR THE CASEE SIMULATION MODEL Final Report
William A. Meroney and Michael G. Temple 15 Aug. 1973 26 p refs
(Contract N62269-72-C-0924)
(AD-771416; KTR-655-1) Avail: NTIS CSCL 01/3

The document describes, and gives user instructions for, two programs developed by KETRON to provide aircraft readiness and part availability data for the CASEE simulation model. These programs have been developed and tested on a CDC 6600 with 64K words of core. They are coded in FORTRAN 4, with the exception of COMPASS subroutines used to read the 3-M MAF and READY tapes. Conversion of the FORTRAN code to a programming environment where these tapes could be read directly in FORTRAN (e.g., IBM System 360 OS), would eliminate the need for the assembly language subroutines. Author (GRA)

N74-17767# AeroVironment, Inc., Pasadena, Calif.
AIRCRAFT VORTEX WAKE DESCENT AND DECAY UNDER REAL ATMOSPHERIC EFFECTS Final Report, Sep. 1972 - Feb. 1973
P. B. S. Lissaman, S. C. Crow, P. B. MacCready, Jr., I. H. Tombach, and E. R. Bate, Jr. Oct. 1973 211 p refs Sponsored in part by Transportation Sys. Center
(AD-771311; TSC-FAA-73-20) Avail: NTIS CSCL 01/1

Aircraft vortex wake descent and decay in a real atmosphere is studied analytically. Factors relating to encounter hazard, wake generation, wake descent and stability, and atmospheric dynamics are considered. Operational equations for encounter hazard, wake generation, and atmospheric dynamics are given, including a brief description of a possible automatic meteorological system to provide atmospheric data for an airport wake forecasting program. A new analysis for Crow instability in ambient turbulence is given, expressing time-to-linkage as an explicit function of the turbulent dissipation. GRA

N74-17768# Goodrich (B. F.) Co., Brecksville, Ohio.
AN EXPERIMENTAL STUDY OF THE PURE-YAW FREQUENCY RESPONSES OF THE 18 X 5.5 TYPE 7 AIRCRAFT TIRES Final Technical Report, Oct. 1971 - May 1973
Fang-Haui H. Ho and Michael F. Hall Jun. 1973 150 p refs
(Contract F33615-72-C-1268; AF Proj. 1369)
(AD-771490; AFFDL-TR-73-79) Avail: NTIS CSCL 01/3

The steady-state yawed rolling parameters and the frequency responses of the tire forces and moments are obtained for a group of six (6) 18x5.5 type 7 aircraft tires. This group includes tires with rib and dimple tread designs, 8 ply and 14 ply carcass ratings, relatively new and worn tread conditions, as well as radial and bias carcass constructions. With various load, camber, yaw amplitude and frequency test conditions, the results are presented in fifty-nine (59) sets of frequency response curves. The effects of various test conditions are discussed. A comparison of the radial, shimmy, and non-shimmy tires is given. Correlations between the experimental data of the aircraft tires and the well-known stretched string tire model has also been carried out and discussed in the report. Author (GRA)

N74-17769# Environmental Protection Agency, Washington, D.C. Office of Noise Abatement and Control.
IMPACT CHARACTERIZATION OF NOISE INCLUDING IMPLICATIONS OF IDENTIFYING AND ACHIEVING LEVELS OF CUMULATIVE NOISE EXPOSURE Final Report
27 Jul. 1973 296 p refs
(PB-224408/5GA; EPA-NTID73.4) Avail: NTIS HC $6.50 CSCL 06S

An extensive task force effort to gather all available data pertinent to impact characterization of noise including implications of identifying and achieving levels of cumulative noise exposure is discussed. GRA

N74-17770# Environmental Protection Agency, Washington, D.C. Office of Noise Abatement and Control.
REVIEW AND ANALYSIS OF PRESENT AND PLANNED FAA NOISE REGULATORY ACTIONS AND THEIR CONSEQUENCES REGARDING AIRCRAFT AND AIRPORT OPERATIONS Final Report
27 Jul. 1973 183 p
(PB-224405/1GA; EPA-NTID 73.6) Avail: NTIS HC $5.25 CSCL 01E

The report is a result of an extensive task force effort to gather all available data pertinent to review and analysis of present and planned FAA noise regulatory actions and their consequences regarding aircraft and airport operations. It represents the interpretation of such data by the task group chairman responsible for this specific report. It does not necessarily reflect the official views of EPA and does not constitute a standard, specification or regulation. GRA

N74-17771# Environmental Protection Agency, Research Triangle Park, N.C. Task Group 4.
NOISE SOURCE ABATEMENT TECHNOLOGY AND COST ANALYSIS INCLUDING RETROFITTING Final Report
William C. Sperry 27 Jul. 1973 303 p refs
(PB-224422/6GA; EPA-NTID73.5) Avail: NTIS HC $7.00 CSCL 01C

The report is a result of an extensive task force effort to gather all available data pertinent to noise source abatement technology and cost analysis including retrofitting. It represents the interpretation of such data by the task group chairman responsible for this specific report. It does not necessarily reflect the official views of EPA and does not constitute a standard, specification or regulation. Author (GRA)

N74-17772# Whittaker Corp., San Diego, Calif. Research and Development Div.
COMPOSITE-MATERIAL HELICOPTER ROTOR HUBS Final Technical Report, Mar. 1971 - Nov. 1972
B. Levenetz Jul. 1973 253 p refs
(Contract DAAJ02-71-C-0032; DA Proj. 1F1-62208-A-170)
(AD-771973; MJO-3027; USAAMRDL-TR-73-14) Avail: NTIS CSCL 01/3

The report describes the development work for construction of helicopter rotor hubs from fibrous composite materials. The prototype hubs were designed to be structurally and functionally

equivalent to the metallic hub used on the Sikorsky CH-54B helicopter. The design is based on the principle of filament-wound tension loops in combination with laminated shear panels. The report contains a description of the design elements, of the structural analysis, of the construction methods, and of the experimental evaluation of rotor hubs subjected to static as well as cyclic loads. Design and construction problems are discussed, and the potential of the composite hub concept is outlined. (Modified author abstract) GRA

N74-17773# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
THE EVALUATION OF A STALL-FLUTTER SPRING-DAMPER PUSHROD IN THE ROTATING CONTROL SYSTEM OF A CH-54B HELICOPTER Final Report
David O. Adams Aug. 1973 104 p refs
(Contract DAAJ02-71-C-0058)
(AD-771962; SER-64372; USAAMRDL-TR-73-55) Avail: NTIS CSCL 01/3

The report describes a program conducted to evaluate the effect of rotating control system damping on stall-induced control loads and on aircraft handling qualities in stall. Such damping was introduced in the CH-54B control system by replacing the standard pushrods by a spring-damper assembly. The CH-54B helicopter was chosen as the test vehicle because it exhibits stall-induced loads. Dynamic analyses defined pushrod stiffness and damping characteristics required to reduce the high-frequency torsional response of the main rotor blades. Spring-damper pushrods exhibiting the desired characteristics were designed, fabricated, and laboratory tested to assure that design requirements were met. The spring-damper pushrods were installed on a test rotor head and tested on the Sikorsky main rotor whirl tower. (Modified author abstract) GRA

N74-17774# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
AEROELASTIC ANALYSIS OF A TELESCOPING ROTOR BLADE Final Report
Raymond G. Carlson and Sebastian J. Cassarino Aug. 1973 122 p refs
(Contract DAAJ02-72-C-0025; DA Proj. 1F1-63204-D-157)
(AD-771963; USAAMRDL-TR-73-48) Avail: NTIS CSCL 01/3

Two computer programs were developed to evaluate the aeroelastic response of a telescoping rotor blade (TRAC). The first program calculates the uncoupled blade natural frequencies for flatwise, edgewise, and torsional degrees of freedom. The second program is a forced-response program and is a modification of the computer program provided to the Army under Contract DAAJ02-71-C-0024. It calculates the time history of the response of either a single blade or the complete rotor on a rigid-body airframe. Both steady-state and transient response can be analyzed. The forced-response program uses blade mode shapes and natural frequencies calculated from the natural frequency program. The mathematical model used reflects the unique structure of the TRAC blade, which consists of torque tube, outboard blade, jackscrew, and two tension straps. (Modified author abstract) GRA

N74-17775# Electro Development Corp., Lynwood, Wash.
HELICOPTER GROSS WEIGHT AND CENTER OF GRAVITY MEASUREMENT SYSTEM Final Report
Richard L. Dybvad Aug. 1973 76 p refs
(Contracts DAAJ02-71-C-0029; DAAJ02-72-C-0053; DA Proj. 1F1-62205-A-529)
(AD-771955; USAAMRDL-TR-73-66) Avail: NTIS CSCL 01/3

The design of an on-board gross weight and center of gravity measurement system applicable to the CH-47 and UH-1 helicopters was developed, and a prototype CH-47 system was evaluated in the laboratory. Gross weight accuracies of plus or minus 1.6% of maximum design weight were achieved in a laboratory simulation of the environment. A flightworthy prototype was subsequently fabricated and evaluated in flight tests on a CH-47 helicopter at the U.S. Army Aviation Systems Test Activity, Edwards AFB, California. The results show accuracies of plus or minus 1% full scale with the helicopter in a rotors-static condition. With rotors-in-motion, however, errors up to 5000 lb occurred in the gross weight due to the inaccuracy of the rotor lift measurement. It is concluded that the method of measuring rotor lift via rotor structural stresses is viable, but further investigation is required into the nature of the thermal stresses and dynamic forces induced by hot lubricants and pitch actuator cylinder. Author (GRA)

N74-17776# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TAKE-OFF VELOCITIES
M. Rozenblat 28 Nov. 1973 12 p Transl. into ENGLISH from Grazhdanskaya Aviatsiya (Moscow), no. 5, May 1973 p 26-27
(AD-771632; FTD-HT-23-534-74) Avail: NTIS CSCL 01/3

In the last 10-15 years the aeronautical engineering characteristics of cargo aircraft have changed considerably. There has been a sharp increase in the ranges of possible flight velocities and flying weights and flight safety requirements have been raised. However, the method of using aerodynamic corrections to the velocity indicator retained a number of tolerances which were valid earlier. Under modern conditions these tolerances lead to considerable errors in information on flight velocity under certain important flight modes, in particular under the conditions of take-off. GRA

N74-17777# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
DEVELOPMENT OF DESIGN AND ANALYTICAL TECHNIQUES FOR ADVANCED COMPOSITE AIRCRAFT STRUCTURES. VOLUME 1: INTERACTIVE PROGRAM IN ADVANCED COMPOSITES TECHNOLOGY: PROGRAM REVIEW Final Report, 1 Nov. 1971 - 31 Aug. 1973
T. A. Cruse Sep. 1973 86 p refs
(Contract F33615-72-C-1214; AF Proj. 6169CW)
(AD-771790; SM-73-12; AFML-TR-73-145-Vol-1) Avail: NTIS CSCL 11/4

The work includes: continuing development of university-industry interaction; development of educational material including reports on manufacturing methods, Weibull statistics, and stresses due to an elliptical hole in an anisotropic plate; and, advanced research into synthesis procedures for mechanically fastened joints and elastic fracture mechanics for laminated composite plates. The research projects demonstrate useful design capabilities, new analystic and numerical results, and experimental data. (Modified author abstract) GRA

N74-17778# Army Foreign Science and Technology Center, Charlottesville, Va.
AIR MOBILE TECHNICAL MAINTENANCE UNIT
V. Yurev 16 Nov. 1973 6 p Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 1, 1972 p 22
(AD-771786; FSTC-HT-23-2102-72) Avail: NTIS CSCL 01/3

The report describes a typical maintenance facility and maintenance problems extant in a Soviet helicopter unit. GRA

N74-17779# Battelle Columbus Labs., Ohio.
GENERAL AVIATION COST IMPACT STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
J. W. Chadwick, T. W. Hall, E. T. Yeager, and R. W. Cote Jun. 1973 36 p refs
(Contract DOT-FA72WA-3118)
(AD-771603) Avail: NTIS CSCL 01/3

The report in four volumes presents the results of an analysis of the effects of cost changes on general aviation activity. The major objectives of the study were to investigate ownership and operating costs in each segment of general aviation, and to develop methodology for evaluating the cost impact of regulatory changes on general aviation activity. The study effort included compilation of a cost and activity data base, definition of fixed and variable cost centers, determination of cost sensitivity relationships and determination of cost impact relationships. Volume 1 provides a summary of the overall study. (Modified author abstract) GRA

N74-17780# Battelle Columbus Labs., Ohio.
GENERAL AVIATION COST IMPACT STUDY. VOLUME 2: RESEARCH METHODOLOGY Final Report
J. W. Chadwick, T. W. Hall, E. T. Yeager, and R. W. Cote Jun.

1973 133 p
(Contract DOT-FA72WA-3118)
(AD-771606) Avail: NTIS CSCL 01/3

The report in four volumes presents the results of an analysis of the effects of cost changes on general aviation activity. Volume 2 presents the rationale and methodology used in the analysis. (Modified author abstract) GRA

N74-17781# Battelle Columbus Labs., Ohio.
GENERAL AVIATION COST IMPACT STUDY. VOLUME 3: PLANNING GUIDE Final Report
J. W. Chadwick, T. W. Hall, E. T. Yeager, and R. W. Cote Jun. 1973 218 p
(Contract DOT-FA72WA-3118)
(AD-771759) Avail: NTIS CSCL 01/3

The report in four volumes presents the results of an analysis of the effects of cost changes on general aviation acitivity. The major objectives of the study were to investigate ownership and operating costs in each segment of general aviation, and to develop methodology for evaluating the cost impact of regulatory changes on general aviation activity. The study effort included compilation of a cost and activity data base, definition of fixed and variable cost centers, determination of cost sensitivity relationships and determination of cost impact relationships. The results are presented in graphical form in Volume 3 of this report to facilitate easy use. (Modified author abstract) GRA

N74-17782# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CLIMBING PERFORMANCE
S. Skripnichenko 30 Nov. 1973 12 p Transl. into ENGLISH from Grazhdanskaya Aviatsiya (Moscow), no. 7, Jun. 1973 p 24-25
(AD-772052; FTD-HT-23-538-74) Avail: NTIS CSCL 01/2

The report develops an optimum climbing attitude for commercial aircraft to obtain a maximum climb rate using a safe and economical procedure. GRA

N74-17783# Army Materiel Systems Analysis Agency, Aberdeen Proving Ground, Md.
HELICOPTER WEIGHT, SIZE, AND PERFORMANCE PROGRAM
George W. Koch Jun. 1973 60 p refs
(DA Proj. 1T6-65706-M-541)
(AD-771140; AMSAA-TR-65) Avail: NTIS CSCL 01/3

The report portrays an analysis method which was developed for determining the weight, size, and performance of helicopters. The analysis method was programmed in FORTRAN 4 for use on a high speed digital computer (BRLESC). The program was specifically developed for trending and comparison purposes. There are sixteen helicopter characteristics, such as: speed, range, payload, disc loading, blade solidity, passive defense features, etc., which can be varied in order to give insight into their effects on the weight, size, and performance of helicopters. All of the characteristics are coordinated so that the effect of them on each other can be examined in context. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-17784*# Little (Arthur D.), Inc., Cambridge, Mass.
FEASIBILITY STUDY OF A SATELLITE SOLAR POWER STATION Final Report
Peter E. Glaser, Owen E. Maynard (Raytheon Co., Sudbury, Mass.), John Mackovciak, Jr. (Grumman Aerospace Corp.), and Eugene L. Ralph (Spectrolab., Inc., Sylmar, Calif.) Washington NASA Feb. 1974 199 p refs
(Contract NAS3-16804)
(NASA-CR-2357; ADL-C-74830) Avail: NTIS HC $5.50 CSCL 10A

A feasibility study of a satellite solar power station (SSPS) was conducted: (1) to explore how an SSPS could be "flown" and controlled in orbit; (2) to determine the techniques needed to avoid radio frequency interference (RFI); and (3) to determine the key environmental, technological, and economic issues involved. Structural and dynamic analyses of the SSPS structure were performed, and deflections and internal member loads were determined. Desirable material characteristics were assessed and technology developments identified. Flight control performance of the SSPS baseline design was evaluated and parametric sizing studies were performed. The study of RFI avoidance techniques covered: (1) optimization of the microwave transmission system; (2) device design and expected RFI; and (3) SSPS RFI effects. The identification of key issues involved (1) microwave generation, transmission, and rectification and solar energy conversion; (2) environmental-ecological impact and biological effects; and (3) economic issues. The feasibility of the SSPS based on the parameters of the study was established. Author

N74-17785*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIQUID ROCKET ACTUATORS AND OPERATORS Space Vehicle Design Criteria (Chemical Propulsion)
May 1973 158 p refs
(NASA-SP-8090) Avail: NTIS HC $5.00 CSCL 22B

All the types of actuators and associated operators used in booster, upper stage, and spacecraft propulsion and reaction-control systems except for chemical-explosive actuators and turbine actuators are discussed. Discussion of static and dynamic seals, mechanical transmission of motion, and instrumentation is included to the extent that actuator or operator design is affected. Selection of the optimum actuator configuration is discussed for specific application which require a tradeoff study that considers all the relevant factors: available energy sources, load capacity, stroke, speed of response, leakage limitations, environmental conditions, chemical compatibility, storage life and conditions, size, weight, and cost. These factors are interrelated with overall control-system design evaluations that are beyond the scope of this monograph; however, literature references are cited for a detailed review of the general considerations. Perinent advanced-state-of-the-art design concepts are surveyed briefly. Author

N74-17786*# Linguistic Systems, Inc., Cambridge, Mass.
DC GENERATOR FOR KOLKHOZ WIND POWERED GENERATORS
K. I. Shenfer and A. Ivanov Washington NASA Mar. 1974 11 p refs Transl. into ENGLISH from Elektrichestvo (USSR), v. 61, 1940 p 14-16
(Contract NASw-2482)
(NASA-TT-F-15347) Avail: NTIS HC $4.00 CSCL 10A

The use of carborundum-graphite resistors to control the voltage output from small wind-powered generators is described. Experiments were performed for devising methods of regulating dc generators to supply constant voltage, and a new type of nonlinear resistor was developed for use as a regulator. Author

N74-17787*# Linguistic Systems, Inc., Cambridge, Mass.
THE PRESENT STATUS OF HONNEF WIND POWER PLANTS
P. Juchem Washington NASA Feb. 1974 19 p refs Transl. into ENGLISH from Electrotech. Z., (West Germany), Ausgabe B, v. 7, no. 5, 21 May 1955 p 187-191
(Contract NASw-2482)
(NASA-TT-F-15355) Avail: NTIS HC $4.00 CSCL 10A

The most important energy sources on earth, next to the sun and water, are coal and oil. However, it seems that these deposits will be exhausted in the forseeable future. Large windpower plants are destined to play an important role in the tapping of new energy sources. Their viability must be judged from the research and development work carried out in the U.S.S.R., the U.K., the U.S.A., and Germany. Author

N74-17788*# Boeing Aerospace Co., Seattle, Wash. Kent Space Center.
HIGH VOLTAGE SOLAR ARRAY EXPERIMENTS Final Report
K. L. Kennerud Mar. 1974 136 p refs
(Contract NAS3-14364)

(NASA-CR-121280) Avail: NTIS HC $10.00 CSCL 10A

The interaction between the components of a high voltage solar array and a simulated space plasma is studied to obtain data for the design of a high voltage solar array capable of 15kW at 2 to 16kV. Testing was conducted in a vacuum chamber 1.5-m long by 1.5-m diameter having a plasma source which simulated the plasma conditions existing in earth orbit between 400 nautical miles and synchronous altitude. Test samples included solar array segments pinholes in insulation covering high voltage electrodes, and plain dielectric samples. Quantitative data are presented in the areas of plasma power losses, plasma and high voltage induced damage, and dielectric properties. Limitations of the investigation are described. Author

N74-17789*# Scientific Translation Service, Santa Barbara, Calif.

THE dc GENERATORS FOR UTILIZING WIND POWER

Antonio Carrer Washington NASA Mar. 1974 26 p refs Transl. into ENGLISH from Elettrotecnica (Milan), v. 36, 10-25 Aug. p 376-383

(Contract NASw-2483)

(NASA-TT-F-15351) Avail: NTIS HC $4.50 CSCL 10A

Theoretical considerations are explained and experimental findings pertaining to the possibility of utilizing wind power with electromechanical units comprising various types of direct current machines. Author

N74-17790# Little (Arthur D.), Inc., Cambridge, Mass.

NEW SOURCES OF POWER: SOLAR ENERGY

Peter E. Glaser Sep. 1973 13 p Presented at the World Energy Supplies Conf., London, 18-20 Sep. 1973

Avail: NTIS HC $4.00

Two obstacles to harnassing solar energy, storage and collection, are discussed in terms of solar heating and cooling systems for buildings. The cost ranges for heating with solar energy are compared with the use of conventional fuels. Photovoltaic conversion of solar energy is discussed along with solar energy conversion in space, solar heat engine power plants, wind energy, and ocean thermal gradients for powering large heat engines. K.M.M.

N74-17791*# Yardney Electric Corp., Pawcatuck, Conn.

DEVELOPMENT AND FABRICATION OF SEALED SILVER-ZINC CELLS, PHASE 1 Final Report

Ivan C. Blake and C. Philip Donnel, III Dec. 1973 56 p refs (Contract NAS3-16805)

(NASA-CR-134591) Avail: NTIS HC $6.00 CSCL 10C

A facility was designed, constructed and equipped for the production of prismatic alkaline rechargeable battery cells using inorganic (ceramic) separators. This unique facility is environmentally controlled and contains separate areas for electrode fabrication, separator processing, cell assembly, cell finishing and testing. An initial production run of 125 sealed silver zinc cells, using inorganic separators, was made in the facility in order to provide samples for baseline performance tests. Ten of these cells were given performance characterization and life cycle tests. Author

N74-17792*# Kanner (Leo) Associates, Redwood City, Calif.

WIND POWER, PART 2 - ECONOMIC FEASIBILITY, 1949

G. Lacroix Washington NASA Mar. 1974 23 p refs Transl. into ENGLISH from Tech. Mod., (France), v. 41, nos. 7, 8, 1-5 Apr. 1949

(Contract NASw-2481)

(NASA-TT-F-15419) Avail: NTIS HC $4.25 CSCL 10A

Both classical and theoretical methods for preventing wind engines from overspeeding are described. The greatest drawback in the use of these devices is seen to be their inability to compete with other power sources on an economic basis. In this connection there is a detailed description of the failure of the Grandpa's Knob experiment conducted in Vermont in the early 1940's: the technical defects were minor in comparison to the lack of economic feasibility. Russian efforts and Danish projects are discussed briefly. Author

N74-17793*# General Electric Co., Philadelphia, Pa. Space Div.

MINI-BRAYTON HEAT SOURCE ASSEMBLY DESIGN STUDY. VOLUME 1: SPACE SHUTTLE MISSION Final Report

Dec. 1973 187 p refs

(Contract NAS3-16810)

(NASA-CR-121223-Vol-1; GESP-7103-Vol-1) Avail: NTIS HC $12.50 CSCL 10A

Conceptual design definitions of a heat source assembly for use in nominal 500 watt electrical (W(e)) 1200 W(e)and 2000 W(e) mini-Brayton isotope power systems are reported. The HSA is an independent package which maintains thermal and nuclear control of an isotope fueled heat source and transfers the thermal energy to a Brayton rotating unit turbine-alternator-compressor power conversion unit. Author

N74-17794*# General Electric Co., Philadelphia, Pa. Space Div.

MINI-BRAYTON HEAT SOURCE ASSEMBLY DESIGN STUDY. VOLUME 2: TITAN 3C MISSION Final Report

Dec. 1973 65 p

(Contract NAS3-16810)

(NASA-CR-121223-Vol-2; GESP-7103-Vol-2) Avail: NTIS HC $6.25 CSCL 10A

Major conclusions of the space shuttle heat source assembly study are reported that project a minimum weight design for a Titan 3 C synchronous orbit mission; requirements to recover the heat source in orbit are eliminated. This concept permits location of the heat source end enclosure supports and heat source assembly support housing in a low temperature region external to the insulation enclosure and considers titanium and beryllium alloys for these support elements. A high melting insulation blanket consisting of nickel foil coated with zirconia, or of gold foil separated with glass fiber layers, is selected to provide emergency cooling in the range 2000 to 2700 F to prevent the isotope heat source from reaching unsafe temperatures. A graphic view of the baseline heat source assembly is included. G.G.

N74-17795# Mitre Corp., McLean, Va. Systems Development Div.

SOLAR ENERGY SYSTEMS

Frank R. Eldridge Mar. 1973 100 p refs

(M73-26) Avail: NTIS HC $8.00

Alternative solar energy systems that can be used for generating electricity and producing hydrogen fuels are reviewed. Particular attention is given to the possibility of employing photovoltaic cells to collect the solar energy. Different system sizes are explored, ranging from small household systems of a few kilowatts output, to large systems capable of producing, transmitting, storing, and distributing a major portion of the U.S. energy requirements by the year 2000. Author

N74-17796# Sandia Labs., Albuquerque, N.Mex. Materials Analysis Div.

ANALYSIS OF SILICON-GERMANIUM ALLOYS USED IN THERMOELECTRIC APPLICATIONS

J. C. Russell Oct. 1973 27 p refs

(Contract AT(29-1)-789)

(SLA-73-643) Avail: NTIS HC $3.50

Analytical procedures used in support of a thermoelectric alloy development program are described. Methods used to evaluate raw materials, assess process parameters, and to characterize the alloy are summarized. Emphasis is placed on advantages and disadvantages of the methods for a given determination, particularly with respect to the time required for an analysis, cost in man-hours, and the quality of the result in terms of accuracy and precision. Specific data are included to provide some indication of the efficacy of the methods.

Author (NSA)

N74-17797# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

NOVEL MATERIALS FOR POWER SYSTEMS Semiannual Technical Report, 1 Jun. - 30 Nov. 1973

R. J. Schwartz, C. A. Angell, and R. G. Squires Dec. 1973 56 p refs

(Grant DAHC15-73-G0011; ARPA Order 2338)

(AD-771336) Avail: NTIS CSCL 10/2

The second project is aimed at developing an understanding

of glassy materials which conduct electricity by the movement of protons through structure. The long range objective of the third research program is to modify the distribution of oxidation states which are stable at the surface of a metal oxide catalyst by controlling the dispersion of the catalyst on its inert support. Preliminary kinetic studies of the oxidation of carbon monoxide: A maximum rate exists at about 3% Cr. There seems to be little, if any, effect of the dispersion on activity at chromium contents less than one percent. (Modified author abstract)
GRA

N74-17798# Molecular Energy Corp., Murray Hill, N.J.
CONSTRUCTION OF 850 AND 4,000 AMPERE-HOUR SILVER-ZINC CELLS USING INORGANIC SEPARATOR Final Report, Jul. 1972 - Oct. 1973
Charles Grun Dec. 1973 32 p
(Contract N00024-73-C-5043)
(AD-771397; MEC-10-73) Avail: NTIS CSCL 10/3

A 30 ampere-hour (A.H.) Silver-Zinc cell using government supplied inorganic separator 3420-25-FM was constructed and cycled for 120 50% cycles. Test results are discussed. Two 850 A.H. cells (NR-1 type) and two 4,000 A.H. (Dolphin type) Silver-Zinc cells were constructed using the inorganic 3420-25-FM separator. Testing of these cells will be carried out by the government for use in submersible vehicles. (Modified author abstract)
GRA

N74-17799# Edo Corp., College Point, N.Y. Government Products Div.
EXPERIMENTAL REEL RESPONSE SYSTEM FOR HIGH PERFORMANCE SIMPLIFIED AERIAL REFUELING STORE Final Engineering Report
R. J. Miko, L. Pino, and H. Schwartz Apr. 1973 56 p
(Contract N00019-70-C-0498)
(AD-771389; EDO-9972) Avail: NTIS CSCL 01/2

The report presents the results of a program to verify the feasibility of innovations to a high performance aerial refueling store designed under a previous contract. Operational tests of an experimental hose reel assembly and control system demonstrated the simplicity of system operation and control. The test program demonstrated that the hydrostatic transmission and controls could achieve the desired hose extension, response and retraction accelerations and velocities, and that the hose could be wound onto a 17-inch diameter reel positioned with its axis parallel to the store centerline. Author (GRA)

N74-17800# Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
ENERGY CONSERVATION STRATEGIES
Marquis R. Seidel, Steven E. Plotkin, and Robert O. Reck Jul. 1973 122 p refs
(PB-224493/7GA; EPA-R5-73-021) Avail: NTIS MF $1.45; SOD HC $1.25 as EP1.23/3-73-021 CSCL 21D

Strategies for reducing national energy demands are examined. It is necessary to find out, for each potential energy saving, how much energy is involved and how costly the alternatives would be. Many users get much of their energy at relatively low prices, and are thus encouraged to waste it; the economist calls this price distortion, a form of market failure. The study analyzes the kinds of market failure which seem to cause the present energy crisis, the kinds of government action which could rectify these failures, and the likely response of the economy to moderate price increases. Numerous actions, some large and some small, would be required to restore a more efficient functioning of the market for energy. In an efficient market, energy price increases of 25% would prompt a halving of the growth of energy demand; through 1990, energy needs would grow 40% rather than the 100% projected at current prices.
Author (GRA)

N74-17801# California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
FEASIBILITY STUDY FOR DEVELOPMENT OF HOT-WATER GEOTHERMAL SYSTEMS Final Technical Report
James B. Combs Mar. 1973 126 p refs
(Grant AF-AFOSR-2393-72; ARPA Order 2184)
(AD-771016; IGPP-UCR-73-18; AFOSR-73-2070TR) Avail: NTIS CSCL 10/2

The investigation has been directed toward a feasibility study for the development of hot-water geothermal systems for potential Department of Defense use as an energy source. The research effort has included the gathering of both scientific and engineering data. The world-wide occurrence of both known and probable sites of hot-water (water-dominated) geothermal systems particularly in relation to United States Department of Defense installations are reviewed and discussed. Included are the geological settings and the types of detection techniques that are necessary to delineate geothermal systems.
GRA

N74-17802# Boeing Aerospace Co., Seattle, Wash.
BAR GAP RADIATION TEST Final Report, Oct. - Dec. 1973
Dennis A. Russell Dec. 1973 71 p
(Contract N00014-74-C-0064)
(AD-771426; D180-17847-1) Avail: NTIS CSCL 10/2

A test program was conducted investigating the effects of proton and ultraviolet radiation and thermal cycling on U.S. Navy satellite solar panels. Government-supplied test panels were placed in a vacuum chamber and exposed alternately to 200-keV protons to a fluence of 10 to the 15th power p/sq cm, to 270 hours of ultraviolet radiation at a one sun rate, and to 21 thermal cycles. The performance of the test panels in the form of I-V curves was measured in situ before the start of testing and periodically throughout the test.
Author (GRA)

N74-17803*# Naval Ammunition Depot, Crane, Ind. Quality Evaluation and Engineering Lab.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS: INITIAL EVALUATION TESTS OF 20.0 AMPERE-HOUR NICKEL-CADMIUM SPACECRAFT CELLS MANUFACTURED BY GULTON INDUSTRIES, INCORPORATED
J. D. Harkness 3 Dec. 1973 22 p
(NASA Order S-23404-G)
(NASA-CR-137203; AD-771843; QEEL/C-73-459) Avail: NTIS HC $4.25 CSCL 10/3

The report describes testing and performance of 20.0 ampere-hour Ni-Col spacecraft batteries.
GRA

N74-17804# Energy Research Corp., Bethel, Conn.
HIGH POWERED FLAME HEATED THERMIONIC POWER SOURCE MODULE Final Report, 1 Jun. 1971 - 1 Jun. 1973
Richard E. Engdahl, Joseph F. Engelberger, and B. S. Baker Dec. 1973 71 p refs
(Contract DAAB07-71-C-0222; DA Proj. 1T7-62705-A-053) (AD-771959; ECOM-0222-F-71) Avail: NTIS CSCL 10/2

Drawing upon technology acquired in the development of a 100 watt flame-heated thermionic diode, the contractor addressed the development effort toward a scale up to 1300 watts. The design concept called for a multiplicity of diodes serially connected in a single module. This was deemed necessary to minimize losses in power extraction and in power conditioning. Accomplishments included fabrication of SiC flame barriers in the size required and development of multiple layer refractory metal and insulation assembly techniques using chemical vapor deposition. (Modified author abstract)
GRA

N74-17805# Energy Research Corp., Bethel, Conn.
SECONDARY ZINC-OXYGEN BATTERIES Final Report, Jun. 1972 - Jun. 1973
M. Klein Nov. 1973 46 p refs
(Contract DAAB07-72-C-0272)
(AD-771961; ECOM-0272-F-72) Avail: NTIS CSCL 10/3

The report describes research and development leading to the construction of a long life high energy density sealed zinc-oxygen secondary battery which is capable of operating over the range of temperatures and rates compatible with Army communications and surveillance equipment. It includes investigations and screening of inorganic separator materials, optimization of the rechargeable zinc electrodes, investigation of various rechargeable oxygen electrode schemes, including bifunctional and monofunctional electrodes, and design, fabrication and testing of a lightweight sealed 6 volt, 25 ampere-hour zinc-oxygen battery.
GRA

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-17806*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 123, JANUARY 1974
Jan. 1974 72 p refs
(NASA-SP-7011(123)) Avail: NTIS HC $4.00 CSCL 06E

This special bibliography lists 226 reports, articles, and other documents introduced into the NASA scientific and technical information system in Dec. 1973. Author

N74-17807*# IIT Research Inst., Chicago, Ill. Life Sciences Div.
SURVIVAL OF INFECTIOUS MICROORGANISMS IN SPACE CABIN ENVIRONMENTS Final Report, Jun. 1973 - Jan. 1974
Stanley C. Vana and Richard Ehrlich Jan. 1974 26 p refs
(Contract NAS9-12778)
(NASA-CR-134194; IITRI-L6066-3) Avail: NTIS HC $4.50 CSCL 06M

Aerosol survival and virulence of S. aureus and P. aeruginosa cultures isolated during exposure to simulated space cabin environment was studied using the microthread captured aerosol technique. The aerosol survival of P. aeruginosa isolates did not differ significantly from that of the original culture from which the isolates were obtained. The mean death rate of the isolates was 1.03%/min and that of the controls 1.10%/min. Similarly exposure to the 5 psi environment did not affect the virulence of P. aeruginosa. Both strains of S. aureus (IITRI and NASA) after exposure to 5 psi environment showed some degree of adaptation to this environmental stress. The aerosol death rates of the isolated organisms were 5 to 10-fold lower than of the original cultures. At the same time the virulence of the isolates was approximately 5-fold higher than that of the original culture. Author

N74-17808*# Techtran Corp., Glen Burnie, Md.
PATHOGENIC ACTION OF THE ATMOSPHERE
N. N. Sirotinin Washington NASA Feb. 1974 57 p refs Transl. into ENGLISH from the book "Patologicheskaya Fiziologiya Ekstremalnykh Sostoyaniy' Moscow, Meditsina Press, 1973 p 36-70
(Contract NASw-2485)
(NASA-TT-F-15315) Avail: NTIS HC $6.00 CSCL 06P

The effects of variation atmospheric pressure (hypobaria, hyperbaria) on various parts of the living organism are examined at length. Separate treatment is devoted to the role of low partial oxygen pressure and to hyperoxia primarily in the production of pathological phenomena. Author

N74-17809*# Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL ULCERS INDUCED BY FORCED IMMOBILIZATION IN THE WHITE RAT. 2: ANATAMOPATHOLOGY OF THE GASTRIC LESIONS DEVELOPMENT OF ULCERATIONS AFTER ENDING IMMOBILIZATION
S. Bonfils, C. Richir, F. Potet, G. Liefooghe, and A. Lambling Washington NASA Feb. 1974 18 p refs Transl. into ENGLISH from Rev. Franc. Etudes Clin. Biol. (Paris), v. 4, 1959 p 888-894
(Contract NASw-2481)
(NASA-TT-F-15379) Avail: NTIS HC $4.00 CSCL 06S

Gastric ulcers induced by forced immobilization of rats were studied. The lesions were found to be multiple in 67 to 90% of the cases; complete healing occurred by the ninth day in 80% of the animals with no chronic ulceration. Microscopic study showed the fundamental lesion to be a slough which detaches, leaving the ulcer. Predominant in the histologic pattern were vascular changes in the form of capillary pits. Glandular redifferentiation occurred next to the formative scar. Associated visceral lesions included fatty infiltration of the liver as well as the presence of vacuoles in the renal tubular epithelial cells. Author

N74-17810*# Techtran Corp., Glen Burnie, Md.
PARADOX OF SLEEP MEMORIZATION IN RATS AS A RESULT OF DELAYED SLEEP
P. Leconte and E. Hennevin Washington NASA Feb. 1974 4 p refs Transl. into ENGLISH from J. Physiol. (Paris), suppl., v. 65, Oct. 1972 p 255A-256A
(Contract NASw-2485)
(NASA-TT-F-15380) Avail: NTIS HC $4.00 CSCL 06C

Experiments carried out on 36 rats prove that avoidance conditioning is followed by an increase in duration of paradoxal sleep (PS). When as much as 180 minutes is allowed between conditioning and the possibility of sleep, no significant modification of PS length is noted. Author

N74-17811*# Kanner (Leo) Associates, Redwood City, Calif.
THE PHYSIOLOGICAL EFFECTS OF ACCELERATION ON ASTRONAUTS
L. Tabusse and P. M. Pingannaud Washington NASA Feb. 1974 22 p refs Transl. into ENGLISH from Rev. Fr. Astronaut. (France), v. 3, 1967 p 11-19
(Contract NASw-2481)
(NASA-TT-F-15384) Avail: NTIS HC $4.25 CSCL 06S

The physiopathological effects of types of acceleration varying in direction of application, intensity, and duration are discussed. Reasons are given for the selection of a take-off position allowing the astronaut to receive the accelerative force transversally. Studies of the oxygen saturation level of the arterial blood are reviewed with attention to the influence of this factor on the psychomotor response capability of the individual. Cardiorespiratory problems, including pulmonary collapse, are given particular attention, and there is some discussion of changes in cell morphology and the problem of weight loss due to dehydration. Author

N74-17812*# Techtran Corp., Glen Burnie, Md.
GASTRIC ULCERS IN RATS CAUSED BY RESTRAINT IN A METAL TUBE
R. Lambert, M. S. Martin, and F. Martin Washington NASA Mar. 1974 6 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 161, 20 Mar. 1967 p 816-818
(Contract NASw-2485)
(NASA-TT-F-15388) Avail: NTIS HC $4.00 CSCL 06S

Proof was gathered that conditions of restraint in a metal tube can cause gastric ulcers in rats. The female rat proved to be more susceptible to ulcers than the males. Author

N74-17813*# Techtran Corp., Glen Burnie, Md.
LESIONS OF THE DIGESTIVE SYSTEM DETERMINED BY FORCED IMMOBILIZATION IN PIGS
C. Labie, H. LeBars, and J. Tournut Washington NASA Feb. 1974 7 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 160, 17 Mar. 1966 p 675-677
(Contract NASw-2485)
(NASA-TT-F-15389) Avail: NTIS HC $4.00 CSCL 06S

Pigs subject to experimental restraint by forced immobilization for 24 hours showed in all cases phenomena of sanguine stasis in the gastric mucous membranes and, with 80% of the subjects, ulcers of the fundus mucous. The pancreas of these animals showed lesions of ischemic necrosis which was rather intense and the medullo-suprarenal was in a state of degranulation. The suprarenal and vascular modifications appear to be concomitant and not consecutive and probably have as their origin a central nervous disturbance. Author

N74-17814*# Techtran Corp., Glen Burnie, Md.
REPERCUSSIONS OF RESTRAINT ON THERMAL REGULATION IN THE WHITE RAT KEPT AT DIFFERENT ENVIRONMENTAL TEMPERATURES
M. Prioux-Guyonneau Washington NASA Feb. 1974 8 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 164, 27 Jan. 1970 p 72-75
(Contract NASw-2485)
(NASA-TT-F-15392) Avail: NTIS CSCL 06S

The effects of restraint on thermal regulation are studied using rats kept at various environmental temperatures. Considera-

tions of length of restraint at varying temperatures and relationship of temperature to which returned to recovery are given. Author

N74-17815*# Kanner (Leo) Associates, Redwood City, Calif.
THE COURSE OF TRAUMATIC SHOCK IN DOGS SUSTAINING PROLONGED HYPODYNAMIA
B. R. Yaremenko Washington NASA Mar. 1974 6 p refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 15 Mar. - Apr. 1971 p 83-84
(Contract NASw-2481)
(NASA-TT-F-15395) Avail: NTIS HC $4.00 CSCL 06S

Following a 2-week hypodynamia, traumatic shock developed in dogs after infliction of a somewhat greater trauma than in the control, but, following a 28-day hypodynamia, much less trauma was required for development of shock. Regardless of duration of hypodynamia, the survival period of experimental animals was much less than that of the controls. Author

N74-17816*# Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTION TO THE STUDY OF THE ACTION OF THE ADRENOCORTICAL GLANDS ON THE PRODUCTION OF GASTRIC ULCERATIONS IN THE RAT BY PROLONGED IMMOBILITY
A. Sneer, M. Dinu, V. Stroia, E. Constantin, and I. Nitulescu Washington NASA Mar. 1974 13 p refs Transl. into ENGLISH from Fiziol. Norm. Patol. (Bucharest), v. 15, 1969 p 307-315
(Contract NASw-2481)
(NASA-TT-F-15410) Avail: NTIS HC $4.00 CSCL 06S

Experiments were carried out on male rats, restrained by a special system of immobilization for 24 hr. Weight variations and the mortality rate were investigated, as well as the ulcerated gastric area and urinary eliminations of uropepsin, 17-ketosteroids and 17-hydroxycorticosteroids. Intact animals subjected to immobilization had a mortality of 11%. Immobilization of the adrenalectomized animals induced a mortality of 44%, whereas immobilization combined with the administration of cortisone permitted survival of all animals. Gastric lesions were produced in 78% of the immobilized animals. This increased to 100% in animals subjected to immobilization associated with cortisone and dropped to 44% in adrenalectomized and immobilized rats. None of the controls (rats not immobilized but kept on a fasting diet for the duration of the experiment) exhibited any lesions of the gastric mucosa. Author

N74-17817*# Institute for Research, Houston, Tex.
DEVELOPMENT OF CONCEPT FOR CONCURRENT BIOCIDE GENERATION AND WATER SYSTEM PURIFICATION Final Report
[1974] 78 p
(Contract NAS9-12998)
(NASA-CR-134204) Avail: NTIS HC $7.00 CSCL 06I

An attempt was made to construct an electrochemical system, using iodine, for water purification in Skylab. Data cover measurements of iodine production rates, effect of electrode size and geometry on iodine production rates, and feasibility of using stainless steels as reference electrodes. Author

N74-17818*# Techtran Corp., Glen Burnie, Md.
KINETOSES
A. N. Razumeyev Washington NASA Mar. 1974 27 p refs Transl. into ENGLISH from the book "Patologicheskaya Fiziologiya Ekstremalnykh Sostoyaniy" Moscow, Meditsina Press, 1973 p 332-348
(Contract NASw-2485)
(NASA-TT-F-15324) Avail: NTIS HC $4.50 CSCL 06E

Various aspects of kinetoses are reported. Studies of motion sickness, air sickness, automobile sickness, spacecraft sickness, etc., are outlined. Certain mechanisms of the vestibular apparatus, nystagmus, the vegetative nervous system, and somatic nerves are considered and neurophysiological explanations of possible mechanisms of motion sickness and ways of countering them are given. A review of the world literature on these subjects is included. Author

N74-17819*# Pan American Univ., Edinburg, Tex.
EXPERIMENTAL TEST OF PLANT CANOPY REFLECTANCE MODELS ON COTTON Semiannual Report
Edwin W. LeMaster [1973] 8 p refs
(Grant NGR-44-087-001)
(NASA-CR-137095) Avail: NTIS HC $3.00 CSCL 02C

Spectroradiometric data on the bidirectional reflectance function was collected for a cotton canopy as a function of observer zenith angle, observer angle, and solar zenith angle. The area under study was about 40 miles from the Gulf of Mexico and the prevailing winds blew inland such that cloud formation increased during the day. The standard reflectance panel was constructed of plywood that had been spray painted with a flat white latex paint. Physical and optical plant parameters were measured. A time lapse mechanism was constructed to operate a 16 mm movie camera such that single frames could be exposed at intervals of one per second up to one per hour. Data were digitized from a strip chart recorder and reflectance panel measurements. J.A.M.

N74-17820# Joint Publications Research Service, Arlington, Va.
CONCISE HANDBOOK ON SPACE BIOLOGY AND MEDICINE, PART 1
A. I. Burnazyan, ed., O. G. Gazenko, ed., V. V. Parin, ed. et al 15 Feb. 1974 242 p Transl. into ENGLISH of the book "Kratkiy Spravochnik po Kosmicheskoy Biologii i Meditsine" Moscow, Med., 1972 390 p
(JPRS-61236-1-Pt-1) Avail: NTIS HC $15.25

More than 2,000 definitions of terms are presented that are used in theoretical and applied space biology and medicine and related fields associated with the support of manned flights aboard spaceships and in orbital stations. Author

N74-17821# Joint Publications Research Service, Arlington, Va.
CONCISE HANDBOOK ON SPACE BIOLOGY AND MEDICINE, PART 2
A. I. Burnazyan, ed., O. G. Gazenko, ed., V. V. Parin, ed. et al 15 Feb. 1974 283 p Transl. into ENGLISH from the book "Kratkiy Spravochnik po Kosmicheskoy Biologii i Meditsine" Moscow, Meditsina, 1972 390 p Revised
(JPRS-61236-2-Pt-2) Avail: NTIS HC $17.25

The second part of the handbook continues definitions of terms used in theoretical and applied space biology and medicine and related fields and associated with the support of manned flights aboard spaceships and in orbital stations. Author

N74-17822# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 8, NO. 1, 1974
15 Mar. 1974 142 p refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974
(JPRS-61487) Avail: NTIS HC $10.25

Reported aeromedical research aims to quarantee safety on long space flights and the reliability of the human component in the man spaceship system. For individual titles, see N74-17823 through N74-17843.

N74-17823 Joint Publications Research Service, Arlington, Va.
EFFECT OF TRANSMERIDIONAL FLIGHTS ON THE HUMAN BODY
S. I. Stephanova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 1-14 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 3-12 (For availability see N74-17822 09-04)

The pertinent literature is reviewed. The functions which have exhibited desynchronosis after transmeridional flights are described and the relationship between the time of synchronization of circadian rhythms in the body and local time and the level of the time change, individual factors, geographical direction of the flight (to the west or east) and the outgoing and return flight is discussed. Recommendations on how to reduce the negative effect of transmeridional flight on flight personnel, athletes and businessmen are presented. Author

N74-17824 Joint Publications Research Service, Arlington, Va.
PROBLEMS IN SPACE RADIOBIOLOGY AND RADIATION SAFETY OF SPACE FLIGHTS
C. A. Tobias and Yu. G. Grigoryev *In its* Space Biol. and Aerospace

Med. Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 15-26 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 12-21 (For availability see N74-17822 09-04)

The main criteria are presented for evaluating the radiation hazards of different space flights and qualitative characteristics of these criteria. Results of radiobiological investigations in space are given and approaches to determination of the admissible levels of exposure of cosmonauts to irradiation are described. Author

N74-17825 Joint Publications Research Service, Arlington, Va.
STATISTICAL DYNAMICS OF OXYGEN CONSUMPTION BY MAN DURING MODERATE PHYSICAL WORK
V. K. Vasilyev *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 27-34 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 21-27 (For availability see N74-17822 09-04)

Transient processes of oxygen consumption by man performing moderate physical exercises (about 600 kgm/min) are described mathematically. The processes recorded experimentally are described by different second degree differential equations, the right hand of which are a functions of the load. Mathematical expectations and correlation functions for impulse transient functions are given. Formulas are derived for the first two statistical moments for perturbation to the oxygen partial pressure control circuit in a sealed chamber. The data obtained are used in analyzing and selecting the performance of the oxygen partial pressure control circuit in a life support system. Author

N74-17826 Joint Publications Research Service, Arlington, Va.
USE OF BIOMECHANICS IN INVESTIGATION OF THE HUMAN CARDIOVASCULAR SYSTEM DURING PROLONGED SPACEFLIGHT
V. M. Zaiko and V. G. Aleksandrov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 35-40 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 27-31 (For availability see N74-17822 09-04)

Biomechanical methods can be used in studying the cardiovascular function of cosmonauts exposed to prolonged spaceflight. An adequate mathematical model of a pulsating blood flow in the arteries which has been formulated using the biophysical mechanism of myogenic autoregulation associated evolutionarily with gravity helps in calculating cardiovascular parameters on the basis of hemodynamic characteristics measured indirectly in spaceflight. The model also makes it possible to select physiologically sound criteria for determining the duration of a prolonged spaceflight. Author

N74-17827 Joint Publications Research Service, Arlington, Va.
EFFECT OF ELECTRIC STIMULATION OF THE MEDULLA OBLONGATA ON THE ELECTROCARDIOGRAM AND SOME INDICES OF BLOOD CIRCULATION AND RESPIRATION
B. B. Yegorov and S. A. Skuratova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 41-48 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm Med. (Moscow), v. 8, no. 1, 1974 p 31-36 (For availability see N74-17822 09-04)

The effects of electric stimulation of the rabbit medulla oblongata on arterial pressure, the EKG, respiration and the EEG of the cortex and subcortical structure of the brain were investigated. In most cases stimulation of the medulla oblongata was accompanied by an increase in partial pressure, a decrease in the pulse rate and an increase in respiration rate. It also induced synchronization in the cortex and regulation of the rhythm in subcortical formations. No significant correlation was found between EEG changes and autonomic parameters. Author

N74-17828 Joint Publications Research Service, Arlington, Va.
EFFECT OF ADEQUATE STIMULATION OF THE VESTIBULAR APPARATUS ON IMPULSE ACTIVITY OF SPINAL INTERNEURONS
G. S. Ayzikov and A. V. Mokrousova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 49-56 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 36-41 (For availability see N74-17822 09-04)

The spontaneous impulse activity of plates seven to nine of the lumbosacral part of the spinal cord was studied during adequate stimulation of the otoliths. The following four types of response were discriminated: Increase and decrease in impulse activity, appearance of salvo activity at definite moments in movement of the stand with the animals, and the absence of changes in rhythm of the neurons. It was noted that the period of stimulation of the otoliths is accompanied by phasic changes in the rhythm of interneurons which disappear with cessation of swinging. The noted changes - quickening or thinning of impulse activity - can persist for a long time during the period of the after-effect of vestibular stimulation. Author

N74-17829 Joint Publications Research Service, Arlington, Va.
EXTRASECRETORY FUNCTION OF THE LIVER AND ENZYME SECRETORY FUNCTION OF THE PANCREAS IN RATS AFTER EXPOSURE TO ACCELERATIONS
K. V. Smirnov, I. L. Medkova, and L. G. Goland *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 57-62 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 41-45 (For availability see N74-17822 09-04)

The extrasecretory function of the liver and the enzyme secretory function of the pancreas in rats were studied during the immediate aftereffect period of exposure to transverse accelerations of 10 g for 20 minutes. The biochemical analysis of the main components of bile and the activity of pancreatic enzymes in the pancreas and blood exhibited an increase in the lipid concentration, activation of lipolytic enzymes and inhibition of the activity of amylase and trypsin. These changes were exhibited three hours after the exposure. The changes in the secretory functions of the liver and pancreas seem to be associated with hemodynamic disturbances which develop in the liver and pancreas immediately after an exposure to accelerations. Author

N74-17830 Joint Publications Research Service, Arlington, Va.
EFFECT OF ACCELERATIONS ON THE ACTIVITY OF ASPARTATE AMINOTRANSFERASE OF THE EXTERNAL AND INTERNAL MEMBRANES OF MITOCHONDRIA
I. D. Yertanov and L. A. Rubashkina *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 63-66 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 45-47 (For availability see N74-17822 09-04)

Exposure of rats to transverse accelerations of 36 g for six minutes decreased the specific activity of aspartate aminotransferase of the outer and inner membranes of mitochondria. It is concluded that the decrease was not associated with the intramitochondrial movement of enzyme molecules. This may be brought about by an inactivation of the enzyme by the specific inhibitor or by conformational changes in the structure which followed the formation of the enzyme membrane complex. Author

N74-17831 Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF METHYL ALCOHOL FROM CARBON DIOXIDE AND HYDROGEN FOR REPRODUCING ARTIFICIAL SUGARS **c06**
M. G. Rozenfeld, M. T. Rusov, S. K. Sachenko, and Yu Ye. Sinyak *In its* Space Biol. and Aerospace Med. Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 67-74 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 47-53 (For availability see N74-17822 09-04)

On the basis of thermodynamic values of components in a reaction mixture, the equation constants were calculated for the synthesis of methyl alcohol from carbon dioxide and hydrogen at normal atmospheric pressure and temperatures of 150-400 C. Calculation of equilibrium concentrations in a stoichiometric mixture demonstrated that the absolute quantities of methyl alcohol formed under these conditions were small. The equilibrium constant, transformation level and equilibrium content of methyl alcohol in a stoichiometric mixture at a pressure of 25-350 atm and temperatures of 150-400 C were also determined. It is shown that a high content of methyl alcohol can be attained at such low pressures as 50-100 atm. Author

N74-17832 Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSIOLOGICAL CHANGES IN AN AIRMAN'S ACTIVITY UNDER THE INFLUENCE OF ALCOHOL
B. M. Pikovskiy *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 75-79 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 53-56 (For availability see N74-17822 09-04)

Alcohol-induced changes in the human body exert a negative effect on man's activity and therefore should be regarded as generalized noise in functioning of the man machine system. Disturbances in human activity may occur both in the perception and evaluation of information and in the motor responses. Insignificant doses of alcohol taken before flight or its aftereffect contribute to in-flight emergency situations. Safety measures should include up-to-date methods for the diagnosis of alcohol intoxication and widespread propaganda indicating that the day before the flight and on the day of the flight aircraft personnel must not drink. Author

N74-17833 Joint Publications Research Service, Arlington, Va.
USE OF DIFFERENT METHODS FOR STUDYING SMALL GROUPS APPLICABLE TO GROUP SCREENING PROBLEMS c05
N. A. Gosudarev *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 80-87 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 56-61 (For availability see N74-17822 09-04)

The possibility of prolonged group space flights makes the optimum selection of space crews very important. A series of methods for evaluating the psychological compatibility of crew members has been developed on the basis of theoretical and methodological findings in group selection systems. These methods were used in studying the personality relationships among members of isolated groups which were exposed to conditions similar to spaceflight as well as personality responses as a function of the position occupied by an individual in the group. The use of the methods is illustrated by examinations of skiers who traversed an arctic region. Author

N74-17834 Joint Publications Research Service, Arlington, Va.
FUNCTIONAL TEST WITH DECOMPRESSION OF THE LOWER BODY IN THIRTY-DAY ANTIORTHOSTATIC HYPOKINESIA
V. A. Degtyarev, A. D. Voskresenskiy, N. D. Kalmykova, and Z. A. Kirillova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 88-92 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 61-65 (For availability see N74-17822 09-04)

During a 30-day hypokinetic experiment nine test subjects underwent functional tests with LBNP applied at -35 and -45 mm Hg for ten minutes. Subjectively they tolerated the tests well. Cardiovascular responses were similar to orthostatic responses but less pronounced. During hypokinesia the response to the tests increased. A statistical analysis of the relationship between the heart rate and integral evaluations revealed a correlation between responses to LBNP of -45 mm Hg and the orthostatic load. This indicates the possibility of predicting orthostatic reactions on the basis of LBNP tests. Author

N74-17835 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THIRTY-DAY HYPOKINESIA IN COMBINATION WITH EXPOSURE TO LBNP ON TOLERANCE TO ACCELERATIONS (Gz PLUS) c05
P. M. Suvorov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 93-97 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1974 p 65-68 (For availability see N74-17822 09-04)

The effect of hypokinesia combined with LBNP on tolerance to accelerations was studied. Before and after hypokinesia the subjects were centrifuged at 3 g for 30 sec and at 5 g as long as it could be tolerated. Two days after exposure to hypokinesia and LBNP the duration of tolerance to accelerations of 5 g was 24.2-36.5% of the initial level. This may be brought about by the functional activity of the muscular system and venous tone which results in a marked decrease in systolic volume and cardiac output during exposure to accelerations and accordingly in the early development of optic disturbances. Author

N74-17836 Joint Publications Research Service, Arlington, Va.
ROENTGENOLOGICAL STUDY OF CARDIAC FUNCTION AND MINERAL SATURATION OF BONE TISSUE AFTER THIRTY-DAY HYPOKINESIA
I. G. Krasnykh *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 98-103 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 68-71 (For availability see N74-17822 09-04)

Before and on the fourth day of a 30-day bedrest experiment the cardiac size and output, as well as the contractile function of the myocardium were measured using teleroentgenokymograms. Bone densities of the right heel bone and the first phalanx of the fifth finger on the right hand were determined roentgenophotometrically. In the early recovery period the cardiac size, cardiac output and the force of cardiac contractions decreased whereas the heart rate increased. Bone density also decreased. The countermeasures applied --, physical exercises, lower body negative pressure and muscle electrostimulation -- reduced changes but did not eliminate them entirely. Author

N74-17837 Joint Publications Research Service, Arlington, Va.
EFFECT OF 30-DAY HYPOKINESIA IN COMBINATION WITH LBNP TRAINING ON SOME INDICES OF THE FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM AT REST
A. N. Aleksandrov and A. K. Kochetov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 104-105 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 71-72 (For availability see N74-17822 09-04)

The effects of 30-day bedrest and LBNP training on the functional state of the cardiovascular system at rest were studied in two groups of test subjects. A moderate decline in tone and a delay in blood rate flow were noted in the leg vessels (mainly venules). The systolic blood volume decreased. The cardiac output at first decreased and then gradually increased, reaching the initial level by the 30th day, due to an increase in the heart rate. The changes in the EKG T wave suggested metabolic changes in the myocardium. These changes in the EKG were more distinct in test subjects who were daily subjected to LBNP training. Author

N74-17838 Joint Publications Research Service, Arlington, Va.
REACTIONS OF THE CARDIOVASCULAR SYSTEM DURING 30-DAY SIMULATION OF WEIGHTLESSNESS BY MEANS OF ANTIORTHOSTATIC HYPOKINESIA
A. V. Beregovkin and V. V. Kalinichenko *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1974 (JPRS-61487) 15 Mar. 1974 p 106-112 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 72-77 (For availability see N74-17822 09-04)

Cardiovascular reactions of nine healthy male test subjects were investigated during 30-day bedrest with their heads tilted down 4 deg from the horizontal. During bedrest tests the subjects exhibited moderate changes in the functional state of the cardiovascular system. The use of preventive measures -- physical exercises, lower body negative pressure and muscle electrostimulation -- had a favorable effect on cardiovascular conditioning. This was suggested by a faster recovery of the functional state of the cardiovascular system after completion of the experiment. Antiorthostatic hypokinesia is an acceptable weightlessness stimulation method in selecting preventive measures of cardiovascular deconditioning. Author

N74-17839 Joint Publications Research Service, Arlington, Va.
DYNAMICS OF SOME INDICES OF THE CARDIAC FUNCTION AND ITS CORRELATION WITH SYSTEMIC CIRCULATION DURING THE DAY IN MAN
I. Ye. Oranskiy, V. V. Skryabin, V. S. Sakovich, and A. Ye. Myakota *In its* Space Biol. and Aerospace Med., Vol. 1, No. 8, 1974 (JPRS-61487) 15 Mar. 1974 p 113-118 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 77-80 (For availability see N74-17822 09-04)

Examinations of 60 persons revealed a certain circadian

periodicity of their cardiac function which was dependent in general on their mental and physical activity. The correlations of conjugated parameters of cardiodynamics and hemodynamics were varied and associated with many factors that often were not taken into account. Author

N74-17840 Joint Publications Research Service, Arlington, Va.
FISTULA TUBE AND REGIME OF FORCED FEEDING OF EXPERIMENTAL ANIMALS
N. T. Svistunov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 119-124 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 80-84 (For availability see N74-17822 09-04)

The new design of a stomach fistula tube for feeding experimental animals is reported that consists of a sleeve with a flange made from titanium alloy covered with a biologically inert plastic butacryl. The method for its implantation and the regime selected for feeding the animals are also described. G.G.

N74-17841 Joint Publications Research Service, Arlington, Va.
MAN'S TOLERANCE TO CHEST-BACK TRANSVERSE ACCELERATIONS
Ye. B. Shulzhenko, I. F. Vil-Vilyams, T. N. Krupina, V. I. Pervushin, and M. P. Aleksandrova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 125-127 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 84-85 (For availability see N74-17822 09-04)

Physiological reactions characterizing man's tolerance to transverse accelerations were studied for chest-back positions at acceleration range from 3 to 8 g. The exposure time relationship was established from the following tolerance criteria: general and muscle fatigue, flabbiness sensation in lower extremities and numbness of feet, breathing difficulty, impairment of vision, and disturbance of cardiac activity rhythm. An acceleration of 8 q generally produced increased changes in the EKG. G.G.

N74-17842 Joint Publications Research Service, Arlington, Va.
MODULATING INFLUENCE OF THE OTOLITHS ON REFLEXES OF THE SEMICIRCULAR CANALS
A. A. Lakoza and A. A. Shipov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 128-131 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 85-87 (For availability see N74-17822 09-04)

Reflex interaction of the cupular-endolymphatic and otolithic systems is studied in connection with the appearance of autonomic impairments in some cosmonauts during space flight; this is identified with the motion sickness syndrome and is caused by different etiological factors, especially the impairment in functional interaction of the mentioned systems. The influence of otolithic formations on the reflexes from the semicircular canals are investigated by using models of a unilateral labyrinthectomy on change in the frequency of fallout nystagmus in the case of tilts of the animal in different directions. Author

N74-17843 Joint Publications Research Service, Arlington, Va.
THRESHOLD VALUES OF CORIOLIS ACCELERATION DURING MAN'S ROTATION WITH HEAD MOVEMENTS IN THE SAGITTAL AND FRONTAL PLANES
F. A. Solodovnik *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 132-135 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 87-89 (For availability see N74-17822 09-04)

The threshold values are determined for coriolis accelerations acting on the vestibular apparatus during man's rotating with movement of the head in the sagittal and frontal planes. Author

N74-17844*# Kanner (Leo) Associates, Redwood City, Calif.
NEW TECHNIQUES FOR PRODUCING GASTRIC ULCERATIONS IN THE WHITE RAT: THE ULCER OF CONSTRAINT
G. Rossi, S. Bonfils, F. Lieffogh, and A. Gambling Washington NASA Mar. 1974 6 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 150, 8 Dec. 1956 p 2124-2126
(Contract NASw-2481)
(NASA-TT-F-15382) Avail: NTIS HC $4.00 CSCL 06S

A technique for producing gastric ulceration, consists of the immobilization of a rat in wire netting for 20 hours. Forty-two out of 44 rats exhibited clear ulcerations of the gastric ventricle, permitting the assumption that a fundamental mechanism of gastric functioning was touched. Author

N74-17845*# Kanner (Leo) Associates, Redwood City, Calif.
DEPENDENCE OF PATHOMORPHOLOGICAL CHANGES IN THE GASTRIC MUCOSA ON THE FUNCTIONAL CONDITION OF THE CORTEX AND SUBCORTICAL FORMATIONS OF THE BRAIN
P. F. Kryshen, A. A. Kolpakov, Yu. I. Tkach, I. V. Sakovich, and N. A. Chuich Washington NASA Mar. 1974 9 p refs Transl. into ENGLISH from Patol. Fizol. i Eksperim Terapiya (Moscow), v. 16, no. 6, 1972 p 48-51
(Contract NASw-2481)
(NASA-TT-F-15396) Avail: NTIS HC $3.00 CSCL 06P

It was shown in experiments on rats that a 24-hour forced immobilization induced two states in the animal body: agitation, followed by inhibition. Electrocorticograms, electrophypothalamograms, electrocerebellograms, EKG and respiration and pulse rates, as well as macroscopic examination and microscopic histological studies established a direct relationship between inhibition of the central nervous system and the cardiovascular, respiratory and muscular systems and pathomorphological changes in the stomach, liver and intestine, as well. Inhibition in the central nervous system set in the following order: cortex of the cerebellar Vermis, hypothalamus and cortex of the cerebral hemispheres. Changes in the stomach, intestinal and liver tissues and the congestion phenomena arising lead to the appearance of hemorrhages in the gastrointestinal tract. Author

N74-17846*# Techtran Corp., Glen Burnie, Md.
THE SYNTHESIS OF ADENOSINE-5-CHLORACETOPHONATE: A SPECIFIC INHIBITOR OF ACETYL-CoA-SYNTHETASE
N. N. Gulyayev and L. A. Baranova Washington NASA Mar. 1974 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 213, no. 2, 1973 p 335-337
(Contract NASw-2485)
(NASA-TT-F-15421) Avail: NTIS HC $4.00 CSCL 06O

A description for the preparation of the acetyl-CoA-synthetase inhibitor adenosine-5'-chloracetophosphonate. The processes used by the authors to obtain the compound are given. One mention is made of an in vitro experiment performed using a rabbit's heart. Enzymatic production was decreased in the presence of the compounds. Author

N74-17847*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BONE MINERAL MEASUREMENT FROM APOLLO EXPERIMENT M-078
John M. Vogel (Public Health Service Hospital, San Francisco), Paul C. Rambaut, and Malcolm C. Smith Jan. 1974 40 p refs
(NASA-TM-X-58110; JSC-08680) Avail: NTIS HC $5.00 CSCL 06S

Loss of mineral from bone during periods of immobilization, recumbency, or weightlessness is examined. This report describes the instrumentation, technique, and bone mineral changes observed preflight and postflight for the Apollo 14, 15, and 16 missions. The bone mineral changes documented during the Apollo Program are reviewed, and their relevance to future missions is discussed. Author

N74-17848# Fraunhofer-Gesellschaft zur Forderung der Angewandten Forschung e. V., Grafschaft (West Germany). Inst. fuer Aerobiologie.
INVESTIGATIONS ON SKIN PROTECTION AGAINST HIGHLY TOXIC PHOSPHORIC ACID ESTERS [UNTERSUCHUNGEN ZU EINEM HAUTSCHUTZ GEGENUEBER HOCHTOXISCHEN PHOSPHORSAEURE-ESTERN]
G. Schreiber and H. Herring Bonn Bundeswehramt 1973 38 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung

(BMVg-FBWT-73-30) Avail: NTIS HC $5.00; Bundeswehramt, Bonn 30 DM

Skin penetration of the alky1 phosphates, diisopropyl fluorophosphate (DFP) and n,n-dimethylamino-0-ethylcyano phosphate (Tabun), was investigated, in vitro and in vivo, in guinea pigs and rats. As a basis for the development of skin barrier creams (formulations), a series of polyethylene glycols was chosen. For some formulations a short-time inhibition of Tabun-penetration in vitro was found, which could not be verified in vivo. In vivo all formulations gave an enhancement of penetration. Mixed with Tabun (10:1) polyethylene glycol 400 strongly diminished the penetration of the former substance.

ESRO

N74-17849# Army Medical Research Lab., Fort Knox, Ky.
[STUDIES IN SENSORY PSYCHOPHYSIOLOGY, THE BIOLOGICAL EFFECTS OF LASER RADIATION, AND METHODOLOGY RELATED TO THE PRESERVATION, TRANSFUSION, COLLECTING, PROCESSING, AND SHIPMENT OF HUMAN BLOOD] Annual Progress Report, 1 Jul. 1972 - 30 Jun. 1973
30 Jun. 1973 93 p refs
(DA Proj. 3A0-61102-A-91C; DA Proj. 3A0-61102-B-71P; DA Proj. 3A0-61102-B-71R; DA Proj. 3A0-62110-A-821)
(AD-771568) Avail: NTIS CSCL 06/5

The research and development effort at the U.S. Army Medical Research Laboratory, Fort Knox, Kentucky, is concerned with studies in sensory psychophysiology, the biological effects of laser radiation, and methodology related to the preservation, transfusion, collecting, processing, and shipment of human blood. The progress during Fiscal Year 1973 and the current status of the various work units are reported herein.

Author (GRA)

N74-17850# Webb Associates, Yellow Springs, Ohio.
METABOLIC RATE DURING SLEEP Final Report
Paul Webb and Mahlon Hiestand Aug. 1973 36 p refs
(Contract F33615-72-C-1875; AF Proj. 7222)
(AD-771024) Avail: NTIS CSCL 06/16

Twenty men between 19 and 63 years of age were studied for two nights of sleep by recording electroencephalography, electrooculography, and electromyography in standard configuration to allow scoring for sleep stages 1, 2, 3, 4, and rapid eye movement. At the same time oxygen consumption was measured continuously with a Metabolic Rate Monitor. Heart rate was recorded continuously, and the overnight decrease in rectal temperature and body weight was determined. Because of a clear first night effect, second night data were selected for analysis. There was no evident relationship between sleep stage and oxygen consumption. Mean oxygen consumption for the 20 men was 275 ml/min plus or minus 100 ml/min(standard deviation). Heart rates were found to average as low as 49 and as high as 71 beats/min. One surprising observation was that most of the older subjects exhibited periodic breathing at various times during the night. Nine of 11 men older than 45 had bouts of apnea alternating with mild hyperventilation. None of the nine men younger than 45 showed it. Periodic breathing occurred primarily during sleep stage 2, less often during REM and stage 1.

Author (GRA)

N74-17851# Duke Univ., Durham, N.C. School of Engineering.
HEAT AND MASS TRANSFER IN THE HUMAN RESPIRATORY TRACT AT HYPERBARIC PRESSURES Progress Report
L. Sigfred Linderoth, Jr. and Ernest A. Kuonen May 1973 284 p refs
(Contract N00014-67-A-0251-0018; NR Proj. 101-895)
(AD-771370) Avail: NTIS CSCL 06/19

The primary objective of this study is to model the simultaneous heat and momentum transfer in the lower respiratory tract using metal pipe. The inlet gas temperature for this study was kept near 80F, and the wall temperature near 118F, giving approximately the same temperature differential between the tube walls and the gas stream. A hot wire anemometer, coupled to a micromanipulator was used to take both temperature and velocity measurements. Readings were taken at thirty horizontal and thirty vertical equispaced radial positions. Data was recorded on a digital printer and reduced by appropriate programs. The anemometer calibration curve was included in the reduction programs. Experimental velocity and temperature profiles are presented in two and three dimensional format. An analysis of an overall heat transfer coefficient for each branch and each bifurcation is presented. A bulk temperature was calculated at each axial position and from this data an overall heat transfer coefficient was determined. (Modified author abstract) GRA

N74-17852# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
FOUNDATIONS OF SPACE BIOLOGY AND MEDICINE, VOLUME 2, PART 3, CHAPTER 3: IMPACT ACCELERATIONS
James W. Brinkley and Henning E. VonGierke May 1973 75 p refs
(AF Proj. 7231)
(AD-771612; AMRL-TR-73-68-Vol-2-Pt-3-Ch-3) Avail: NTIS CSCL 06/19

The problem most specific to space medicine is the potential change of impact tolerance due to reduced bone mass and muscle strength caused by prolonged weightlessness and physical inactivity. Considerably more research is required as space missions will be extended over many weeks and months. The relationship between bone strength, bone mass and muscle strength must be explored as a function of gravitational load, isotonic and isometric exercise, time pattern and diet; for osteoporosis of disuse appropriate time scaling factors for bone dynamics as a function of gravitational exposure and activity time patterns must be established relating animal experiments to human conditions. Changes in injury patterns due to these changes in the musculoskeletal system must be known and understood.

GRA

N74-18459* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VISUAL LIGHT FLASH PHENOMENON
L. S. Pinsky (Houston Univ.), W. Z. Osborne (Houston Univ.), and J. V. Bailey *In its* Apollo 17 Prelim. Sci. Rept. 1973 6 p refs (For availability see N74-18428 09-30)
CSCL 06P

N74-18577 Joint Publications Research Service, Arlington, Va.
FIFTH INTERNATIONAL CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS
N. M. Emanuel, L. P. Kayushin, and Ya. I. Azhipa *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 p 103-106 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 77-78 Conf. held at New York, 4-8 Dec. 1972 (For availability see N74-18567 09-34)

N74-18616 Queens Univ., Kingston (Ontario).
INTERACTION OF ELECTROMAGNETIC FIELDS AND LIVING SYSTEMS WITH SPECIAL REFERENCE TO BIRDS
C. Romero-Sierra, J. A. Tanner (NRC), and J. BigudelBlanco *In* NRC Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 31 Dec. 1973 p 27-49 refs (For availability see N74-18613 09-34)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-17853* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METERING GUN FOR DISPENSING PRECISELY MEASURED CHARGES OF FLUID Patent
Thomas A. Cook (McDonnell-Douglas Corp., Huntington Beach, Calif.) and Hans Scheibe, inventors (to NASA) (McDonnell-Douglas Corp., Huntington Beach, Calif.) Issued 5 Feb. 1974 8 p Filed 28 Jun. 1972 Supersedes N72-28098 (10 - 19, p 2517) Sponsored by NASA
(NASA-Case-MFS-21163-1; US-Patent-3,790,037;

US-Patent-Appl-SN-266925; US-Patent-Class-222-324; US-Patent-Class-224-444) Avail: US Patent Office CSCL 06I

A cyclically operable fluid dispenser for use in dispensing precisely measured charges of potable water aboard spacecraft is described. The dispenser is characterized by (1) a sealed housing adapted to be held within a crewman's palm and coupled with a pressurized source of potable water; (2) a dispensing jet projected from the housing and configured to be received within a crewman's lips; (3) an expansible measuring chamber for measuring charges of drinking water received from the source; (4) and a dispenser actuator including a lever extended from the housing to be digitated for initiating operational cycles, whereby precisely measured charges of potable water selectively are delivered for drinking purposes in a weightless environment.
Official Gazette of the U.S. Patent Office

N74-17854*# Martin Marietta Corp., Denver, Colo.
SHUTTLE PASSENGER COUCH Final Report
A. A. Rosener and M. L. Stephenson Jan. 1974 120 p
(Contract NAS9-13010)
(NASA-CR-134200; MCR-74-40) Avail: NTIS HC $9.00 CSCL 06Q

Conceptual design and fabrication of a full scale shuttle passenger couch engineering model are reported. The model was utilized to verify anthropometric dimensions, reach dimensions, ingress/egress, couch operation, storage space, restraint locations, and crew acceptability. These data were then incorported in the design of the passenger couch verification model that underwent performance tests. G.G.

N74-17855# Flying Personnel Research Committee, London (England).
TESTING PREDICTIONS DERIVED FROM A MODEL OF PROGRESSIVE ADAPTATION TO CORIOLIS ACCELERATIONS
A. J. Benson, J. T. Keason, and E. Diaz Jul. 1971 20 p refs
(FPRC/1311) Avail: NTIS HC $4.00

A theoretical model for progressive adaptation to Coriolis accelerations is described. Thirteen subjects are tested under procedures using diminishing velocity increments, with an initial step of 3 rev/min. The findings provide positive, but as yet, limited support for the theoretical model described. Author

N74-17856# Joint Publications Research Service, Arlington, Va.
ALGORITHM OF OPERATOR ACTIVITIES IN PROCESS OF TARGET CLASSIFICATION ON RADAR SCOPE
A. Kh. Gildeyev, T. M. Strokova, E. A. Ulanov, and I. N. Khutoryan 25 Feb. 1974 9 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, 1973 p 139-143
(JPRS-61303) Avail: NTIS HC $4.00

Construction of an algorithm is reported that describes operator activities in the classification of objects observed on the radar scope and which can be used for compatibility evaluation of the CRT output system with psychophysiological features of the operator and for synthesizing the optimum scope-operator function. Author

N74-17857*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE CHEMICAL/PHYSICAL AND MICROBIOLOGICAL CHARACTERISTICS OF TYPICAL BATH AND LAUNDRY WASTE WATERS
Warren D. Hypes, Carmen E. Batten, and Judd R. Wilkins Washington Mar. 1974 31 p refs
(NASA-TN-D-7566; L-9365) Avail: NTIS HC $3.25 CSCL 06I

Chemical/physical and microbiological characteristics are studied of typical bath and laundry waters collected during a 12 day test in which the untreated waste waters were reused for toilet flush. Most significant changes were found for ammonia, color, methylene blue active substances, phosphates, sodium, sulfates, total organic carbon, total solids, and turbidity in comparison with tap water baseline. The mean total number of microorganisms detected in the waste waters ranged from 1 million to 10 to the 7th power cells/m1 and the mean number of possible coliforms ranged from 10 to the 5th power to 1 million. An accumulation of particulates and an objectible odor were detected in the tankage used during the 12 day reuse of the untreated waste waters. The combined bath and laundry waste waters from a family of four provided 91 percent of the toilet flush water for the same family. Author

N74-17858*# National Aeronautics and Space Administration. Pasadena Office, Calif.
AN IMPROVED HEAT STERILIZABLE PATIENT VENTILATOR Patent Application
Alexander S. Irons (JPL), Paul P. Muehter (JPL), and Willie D. Kent, inventors (to NASA) (JPL) Filed 7 Mar. 1974 22 p
(Contract NAS7-100)
(NASA-Case-NPO-13313-1; US-Patent-Appl-SN-449153) Avail: NTIS HC $4.25 CSCL 06L

A modified heat sterilizable patient ventilator is disclosed. The ventilator is characterized by a ported center body, a shell formed of heat sterilizable material mounted on the center body and defining a hermetically sealed reservoir for confining under positive pressure a mixture of bacteria free gas, and a pneumatic circuit including an oxygen delivery jet coupled with an absolute filtration system for delivering a bacteria free mixture of gases to the reservior. NASA

N74-17859# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PSYCHOLOGICAL CONSIDERATIONS IN THE DESIGN OF HELMET MOUNTED DISPLAYS AND SIGHTS: OVERVIEW AND ANNOTATED BIBLIOGRAPHIES Final Report
Richard L. Huhges, L. Ralph Chason, and Jock C. H. Schwank Aug. 1973 95 p refs
(AF Proj. 7184)
(AD-770993; AMRL-TR-73-16) Avail: NTIS CSCL 05/10

An overview of the history and the known and potential psychological problems of helmet-mounted displays is followed by an extensive annotated bibliography of relevant material arranged by topics: eye dominance, brightness disparity, helmet-mounted displays/helmet-mounted sights, retinal rivalry, and the AMD visually-coupled systems symposium (of 1972). The bibliography annotations, which vary in length from one sentence to one-half of a page, describe the contents of the articles but do not evaluate them. Most of the bibliographic entries are not listed in previously published articles on helmet-mounted displays and/or sights. Author (GRA)

N74-17860# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
MINIMIZATION METHODS IN THE DEVELOPMENT OF BIODYNAMIC MODELS
H. T. Mohlman, H. E. Krause, H. L. Oestreicher, and H. L. Vogt Sep. 1973 6 p refs Presented at 21st Intern. Congr. of Aviation and Space Med., Munich, 17-21 Sep. 1973
(Contract F33615-72-C-1402; AF Proj. 7231)
(AD-770992; AMRL-TR-73-86) Avail: NTIS

Mechanical vibrations disturb physiological processes and can inflict injuries. Dynamic forces produce internal relative displacements which interfere with physiological events and thus determine human tolerance. These events must be analyzed if the response of the body under vibrations is to be understood. Customary dynamic analysis is based on a model of the system which is a combination of lumped masses, spring factors, and damping factors, or it is an individual or a combination of continuous elements. The dynamics can now be formulated and quantitatively evaluated. The purpose of this paper is to demonstrate the feasibility of mathematical techniques that do not require prior knowledge of a specific model structure. The procedures derive both model structure and values for the model parameter by minimizing the differences between model performance and experimental observation. GRA

N74-17861# Calspan Corp., Buffalo, N.Y.
PERFORMANCE EVALUATION OF THE GENERAL MOTORS HYBRID 2 ANTHROPOMORPHIC TEST DUMMY Final Report, 17 Feb. - 17 Apr. 1973
J. Sam Miller Sep. 1973 179 p refs
(Contract DOT-HS-053-3-603)
(PB-225005/8GA; CALSPAN-ZS-5272-V-1; DOT-HS-800919) Avail: NTIS HC $5.25 CSCL 13F

A series of twelve static and dynamic component tests were

performed to measure the Hybrid 2 dummy in accordance with the purchase description test procedures and specifications. Twenty belt restraint tests and twenty air bag restraint tests were performed using an accelerator sled to simulate a 30-mph impact crash. The dynamic performance of the dummies was statistically the same in terms of absolute value and variability of the measured parameters. The Hybrid 2 dummy exhibits statistically the same variability as the Alderson hybrid dummy previously tested, but has significantly different absolute values for the dynamic test parameters. GRA

N74-17862# Naval Aerospace Medical Research Lab., Pensacola, Fla.
NAVAL FLIGHT OFFICER FUNCTION ANALYSIS. FINAL REPORT: COMMONALITY OF OPERATIONAL FUNCTIONS Medical Research Progress Report no. 2
Richard E. Doll 2 Nov. 1973 160 p
(MF 51.524)
(AD-771375; NAMRL-1194) Avail: NTIS CSCL 05/9

During 1972, the Naval Aerospace Medical Research Laboratory (NAMRL) conducted a series of investigations analyzing the operational functions of the Naval Flight Officer (NFO). A major part of that series involved the determination of the tasks performed by the NFO in various aircraft. For each of the NFO positions a Function Description Inventory (FDI) was developed. The purpose of this part of the study was to develop a compendium of functions encompassing all the duties and tasks contained in the various FDIs, to have this compendium reviewed by NFO personnel of all the respective operational squadrons and to do a cross-comparison based on these data to provide information as to which NFO communities perform the tasks and to what extent. (Modified author abstract) GRA

N74-17863# Life Sciences, Inc., Hurst, Tex.
TEST OF A MODEL OF VISUAL SPATIAL DISCRIMINATION AND ITS APPLICATION TO HELICOPTER CONTROL Annual Summary Report, 1 Jun. 1972 - 31 May 1973
J. A. Bynum, W. G. Matheny, J. E. Flexman, and R. K. Wilson Nov. 1973 56 p refs
(Contract DADA17-72-C-2110)
(AD-771041; LSI-TR-73-1) Avail: NTIS CSCL 05/10

The investigation tested a model which hypothesizes that the critical visual cue for control of a helicopter is the relationship between a fixed internal referent placed on the helicopter windscreen and an external referent placed on the ground plane. To investigate the likelihood that a pilot could maintain vehicular control through detecting changes in the inter-referent distances, both laboratory and field experiments were designed. The laboratory investigation was concerned with verifying the Weber ratio. The field investigation was devised to permit the filming of pilots' eye movements and measurement of system performance in three translational degrees of freedom during hovering flight. (Modified author abstract) GRA

N74-17864# Air Force Human Resources Lab., Brooks AFB, Tex.
DESCRIPTION AND RESULTS OF THE AIR FORCE RESEARCH AND DEVELOPMENT PROGRAM FOR THE IMPROVEMENT OF MAINTENANCE EFFICIENCY Final Report
John P. Foley, Jr. Nov. 1973 46 p refs
(AF Proj. 1710)
(AD-771000; AFHRL-TR-72-72) Avail: NTIS CSCL 05/9

The paper, one of three prepared for a 1972 symposium, and its accompanying slides give an overview of the Air Force research and development program for the improvement of maintenance efficiency. It emphasizes the use of the task analysis process in all efforts. Although the central theme emphasizes the job performance aids efforts attention is also given to job oriented training and job task performance tests. The results of two experiments are briefly summarized. In addition, a 1972 demonstration combining job performance aids with job oriented training is described. In this demonstration eight high and eight average electronic aptitude subjects were able to perform most types of flight line and field shop maintenance for a Doppler radar and its computer. (Modified author abstract) GRA

N74-17865# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
FEASIBILITY OF A NOVEL TECHNIQUE FOR ASSESSING NOISE-INDUCED ANNOYANCE Final Report, Jul. 1972 - Jan. 1973
Sanford Fidell, Glenn Jones, and Karl S. Pearsons Sep. 1973 107 p refs
(Contract DOT-OS-20103)
(PB-225334/2GA; BBN-2423; DOT-TST-74-3) Avail: NTIS HC $4.25 CSCL 05J

The feasibility of a novel technique for assessing human response to community noise exposure was explored in a field study employing prototype instrumentation. Test participants residing in a wide range of noise environments wore wristwatch-like signalling devices to indicate annoyance; simultaneous measurement of noise exposure was made by special monitoring equipment. It was found that test participants in the pilot study produced consistent data which was amenable to detailed analyses of the nature of annoyance per se, as well as the relationships between annoyance and noise exposure. Author (GRA)

N74-17866# Army Missile Command, Redstone Arsenal, Ala. Aeroballistics Directorate.
TIME SERIES ANALYSIS OF GUNNER TRACKING ERROR
Nancy R. Rich, Maureen M. Wise, Latricha Greene, John Howerton, and Mark C. K. Yang 3 Oct. 1973 182 p refs
(DA Proj. 1M2-63301-D-699)
(AD-771933; RD-TR-73-35) Avail: NTIS CSCL 19/5

The report includes the time series analysis of gunner error data and the formulation of a simulation model to be used in future applications. Author (GRA)

N74-17833 Joint Publications Research Service, Arlington, Va.
USE OF DIFFERENT METHODS FOR STUDYING SMALL GROUPS APPLICABLE TO GROUP SCREENING PROBLEMS
N. A. Gosudarev *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 80-87 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 56-61 (For availability see N74-17822 09-04)

N74-17835 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THIRTY-DAY HYPOKINESIA IN COMBINATION WITH EXPOSURE TO LBNP ON TOLERANCE TO ACCELERATIONS (Gz PLUS)
P. M. Suvorov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 93-97 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1974 p 65-68 (For availability see N74-17822 09-04)

N74-18614 National Research Council of Canada, Ottawa (Ontario).
BIOENGINEERING DEVELOPMENTS: PAST, PRESENT AND FUTURE
J. A. Tanner and C. Romero-Sierra (Queen's Univ., Kingston) *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 31 Dec. 1973 p 1-4 (For availability see N74-18613 09-34)

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-17867*# Tennessee Univ., Knoxville. Earth Resources and Astrophysics Lab.
COMPUTED LINEWIDTHS OF SO2
G. D. T. Tejwani Nov. 1972 35 p refs
(Grant NGL-43-001-021)
(NASA-CR-137083; UTPA-ERAL-02) Avail: NTIS HC $4.75 CSCL 07D

Self-broadened and foreign-gas (N2 and O2) broadened linewidths of sulfur dioxide, for both type A and type B bands, have been calculated using the Anderson-Tsao-Curnutte theory

of line broadening. Computed values of these linewidths at 300 K are given for all the transitions with J < or = 20 and K sub minus 1 < or = 15. Air-broadened linewidths have also been calculated for SO2 at 250 K and 200 K for these transitions. Author

N74-17868*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
A MODIFIED BENEDICT-WEBB-RUBIN EQUATION OF STATE FOR PARAHYDROGEN Final Report
R. D. McCarty Feb. 1974 75 p refs
(NASA Order C-32369-C; NBS Proj. 2750429)
(NASA-CR-137065; NBSIR-74-357) Avail: NTIS HC 6.75 CSCL 07D

A 32 term modified Benedict-Webb-Rubin equation of state has been applied to data for parahydrogen. The adjustable parameters in the equation of state were determined using data from the triple point to 2500 K, with pressures to 680 atmospheres. Extensive modifications have been made to the previously accepted pvt surface for the saturated liquid and vapor phases in the near critical region. These modifications have been made on the basis of subsequent refractive index data and the application of scaling law equations. Comparisons between experimental and calculated data are given. Author

N74-17869# National Research Council of Canada, Ottawa (Ontario).
CALCULATION PRINCIPLES FOR DEVELOPMENT OF GAS-CONDENSATE FIELDS WITH APPLICATION OF THE NEW MODIFIED CYCLING PROCESS
G. R. Gurevich and M. I. Mirkin 1974 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Neft i Gaz (Baku), v. 12 1971 p 39-44
(NRCOTT-1734) Avail: NTIS HC $4.00

A mathematical analysis is made of a modified gas cycling process for condensate fields designed to increase recovery of liquid hydrocarbons. In one feature of the method, only part (40 to 60%) of the produced separated gas is reinjected underground. In another modification of the process, a small volume (4%) of CO2 is added to the injected gas to reduce loss of condensate in the reservoir. In order to define conditions of maximum condensate recovery, production history was calculated for 8 condensate fields, operated with the modified cycling system. The data showed that highest condensate recovery was obtained when CO2 was added to the injection gas. Volumetric and pressure changes occurring in the course of cycling operations are shown graphically. Author

N74-17870# Lockheed Missiles and Space Co., Palo Alto, Calif.
CATALYTIC DECOMPOSITION OF OZONE BY ALUMINUM OXIDE UNDER THE CONDITIONS OF A BOILING CATALYST LAYER
L. F. Atiaksheva and G. I. Emelianova [1974] 3 p refs Transl. into ENGLISH from Zh. Fiz. Khim. (Moscow), v. 47, no. 12, 1973 p 2113-2115
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

A kinetic investigation of the catalytic decomposition of ozone by aluminum oxide under conditions of a boiling catalyst layer has shown that the activity of aluminum oxide is two to three orders below the activity of platinum- palladium -black and nickel oxide. The activation energy of the process is 9.1 kcal/mole. Author

N74-17871# Los Alamos Scientific Lab., N.Mex.
SODIUM: CLEAN-ENERGY STORAGE MEDIUM FOR VEHICULAR POWER
W. K. Brown Sep. 1973 10 p refs
(Contract W-7405-eng-36)
(LA-5406-MS) Avail: NTIS HC $4.00

Metallic sodium is proposed as an energy storage medium to provide pollution-free power for virtually all forms of land, sea, and air transportation. Ideally, electrical energy from efficient, central, nuclear-powered plants would be used in the reduction of ordinary salt to sodium, which would subsequently be carried in vehicles and reacted with water to produce mechanical energy in a hydrogen-fueled engine. Lye, the sole combustion product, would be recycled for continuing use. The scheme appears to offer a competitive alternative to the use of cryogenic hydrogen for vehicular power. Author (NSA)

N74-17872# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
PHOTOCHEMISTRY OF INTERHALOGEN COMPOUNDS OF INTEREST AS ROCKET PROPELLANTS Final Report, Jul. 1970 - Jul. 1972
Arthur E. Axworthy, R. D. Wilson, and K. H. Mueller Sep. 1973 47 p refs
(Contract F44620-70-C-0094; AF Proj. 9711)
(AD-771537; R-9349; AFOSR-73-2183TR) Avail: NTIS CSCL 07/5

The chemical kinetics of the UV photochemical formations of ClF, ClF3, and ClF3O were investigated experimentally to obtain information relating to optimum conditions and the reaction mechanisms involved. An improved experimental apparatus was developed. A mechanism for ClF3O formation is proposed. The photolysis of ClF3 was also investigated and a mechanism proposed. At a wavelength of 365 nm, the quantum yield of the reaction ClF - F2 - hv to ClF3 was found to be about one and that of the reaction Cl2 - F2 - hv to 2 ClF to be considerably less than one. Author (GRA)

N74-17873# Army Foreign Science and Technology Center, Charlottesville, Va.
CALCULATION OF PROBABILITY OF RADIATION FROM DIATOMIC MOLECULAR DIASSOCIATION STATES
V. A. Kochelap 10 Sep. 1973 23 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 15, no. 6, 1970 p 1000-1013
(AD-771414; FSTC-HT-23-1147-73) Avail: NTIS CSCL 07/4

To estimate the possibilities of a laser when a photostimulated chemical reaction is used, the author calculated the probabilities of radiation from diatomic molecular dissociation states. Quantum considerations made it possible to investigate in detail those cases to which classical theory is not applicable and to determine the applicability criteria of the quasiclassical results which were obtained earlier. Numerical estimates confirm the possibility of realizing the laser when the photostimulated reaction is used. GRA

N74-17874# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
MOLECULAR OXYGEN ENHANCED FLUORESCENCE OF ORGANIC MOLECULES IN POLYMER MATRICES
Peter F. Jones and Robert S. Nesbitt 30 Nov. 1973 13 p refs
(Contract F04701-73-C-0074)
(AD-771479; TR-0074(4270-30)-1; SAMSO-TR-73-369) Avail: NTIS CSCL 07/4

It is shown that the oxygen-enhanced fluorescence of organic molecules in polymer matrices can be explained by a trival process involving a high steady-state concentration in the excited triplet state with depopulation of the ground state of the solute in the absence of oxygen. If the triplet-state lifetime is shortened, e.g., by O2 quenching, then the gound-state concentration (and thereby the fluorescence) will increase. (Modified author abstract) GRA

N74-17875# Army Foreign Science and Technology Center, Charlottesville, Va.
CHANGE IN THE RADIATION STABILITY OF LEAD AZIDE
Yu. A. Zakharov and S. M. Ryabykh 12 Aug. 1973 7 p refs Transl. into ENGLISH from Izv. Tomsk. Politekh. Inst., (USSR), v. 176, 1970
(AD-771403; FSTC-HT-23-2137-72) Avail: NTIS CSCL 07/5

The radiolysis of PbN6 under the action of X-ray radiation, as well as the effect of heterophase semiconductors and homophase admixtures on the radiative stability of PbN6, are experimentally studied. Author (GRA)

N74-17876# Aerospace Corp., El Segundo, Calif. Urban Programs Div.
INVESTIGATION OF SURFACE COMBUSTION CONCEPTS FOR NOX CONTROL IN UTILITY BOILERS AND STATIONARY GAS TURBINES Final Report
W. U. Roessler, E. K. Weimberg, J. A. Drake, H. M. White, and T. Iura Aug. 1973 180 p refs

(Grant EPA-R-801490)
(PB-224424/2GA; ATR-73(7286)-2; EPA-650/2-73-014) Avail: NTIS HC $5.25 CSCL 07A

The report reviews the state of the art of concepts of surface combustion (that occurring near a solid surface) and assesses their applicability to large utility boilers and stationary gas turbines. Catalytic combustion looks promising for gas turbines. However, comprehensive experimental and theoretical investigations are required for a meaningful assessment. Catalytic combustion is not considered feasible for existing steam boilers, but might apply to newly designed units. Sintered metal porous-plate combustors with imbedded cooling tubes (a non-catalytic concept), although technically feasible for steam boilers and possibly for low-pressure ratio gas turbines, has packaging problems and requires gaseous and distillate fuels. (Modified author abstract) GRA

N74-17877# Bureau of Mines, Morgantown, W.Va. Energy Research Center.
COMPUTER PROGRAM FOR CALCULATING EQUILIBRIUM COMPOSITION OF HIGH-TEMPERATURE COMBUSTION PRODUCTS
Michael W. Redifer and John S. Wilson 1973 47 p refs
(PB-225077/7GA; BM-IC-8606) Avail: NTIS MF $1.45; SOD HC $0.80 CSCL 07D

A FORTRAN 4 computer program was developed to calculate the equilibrium composition of products from a set of high temperature gas combustion reactions. The program was used to develop high temperature equilibrium concentration profiles for various constituents as a function of temperature and oxygen concentration. The general applicability of the program, its use, and limitations along with instructions for using the program are discussed. GRA

N74-17878# Texas Univ., Austin. Dept. of Physics.
A CAPACITANCE TECHNIQUE FOR THE STUDY OF GAS MOLECULE-SURFACE INTERACTIONS Technical Report, 1 Apr. 1972 - 31 Nov. 1973
William D. McCormick 7 Dec. 1973 15 p refs
(Contract N00014-67-A-0126-0019)
(AD-771429; TR-1) Avail: NTIS CSCL 07/4

The report discusses the development of a new technique for the study of gas molecule-surface interactions based on the capacitance change that occurs in a closely spaced parallel plate capacitor when gas molecules are absorbed on its plates. When the dielectric constant of the film absorbed in the capacitor is plotted as a function of pressure, a sharp bend in the curve appears at the formation of a monolayer. The dielectric constant on the monolayer is found to be considerably larger than would be expected on the basis of the free-molecule polarizability of nitrogen. This enhancement of the polarizability has been attributed to the image dipole produced when a polarized molecule is close to a conducting surface. (Modified author abstract) GRA

N74-17879# Ultrasystems, Inc., Irvine, Calif.
A SURVEY OF VIBRATIONAL RELAXATION RATE DATA FOR PROCESSES IMPORTANT TO CO2-N2-H2O INFRARED PLUME RADIATION Technical Report, Nov. 1972 - May 1973
Jay A. Blauer and Gary R. Nickerson Oct. 1973 75 p refs
(Contract F04611-73-C-0032)
(AD-771554; SN-8225/TR; AFRPL-TR-73-57) Avail: NTIS CSCL 07/4

A comprehensive survey of relaxation rate data important in the modeling of nonequilibrium infrared radiation from exhaust plumes at altitude is presented. A model is developed which considers energy transfer among the first fourteen vibrational states of CO2, the first five of H2O, and up to the first three states of each of the diatomic molecules considered, i.e., of N2, O2, CO, OH, and H2. Available data are first assembled for those processes that have been subjected to experimental analysis. Where possible, statistical and/or quantum considerations are used to relate unmeasured rate constants to those whose values are known. Finally, resort is made to available theory to obtain estimates for the rate constants for the balance of the interactions important to the overall model. Author (GRA)

N74-17880# Bureau of Mines, Bartlesville, Okla.
SMOG CHAMBER REACTIVITIES OF EMISSIONS FROM LEADED AND LEAD-FREE FUELS
G. P. Sturm, Jr. and Basil Dimitriades Oct. 1973 19 p refs
(PB-225288/0GA; BM-RI-7803) Avail: NTIS HC $2.75 CSCL 07D

This work was done to determine photochemical specific reactivities of emissions from automobiles using leaded premium and regular grade fuels and prototype lead-free fuels of comparable octane quality. Emissions were photoirradiated at three sets of initial hydrocarbon and oxides of nitrogen concentrations. The results indicate that the evaporative emissions samples and the evaporative plus exhaust emissions samples from the lead-free fuels have, in general, higher reactivities per gram than those from the leaded fuels. For the samples containing only exhaust emissions, the only trend observed was the lower specific reactivity exhibited by the leaded premium fuel exhaust. These differences in specific reactivity are taken to reflect the differences in hydrocarbon composition of the fuels and their evaporative and exhaust emissions rather than any difference in lead content per se. (Modified author abstract) GRA

N74-17881# Bureau of Mines, Reno, Nev.
CATALYTIC ACTIVITY OF RARE-EARTH OXIDES FOR THE OXIDATION OF HYDROGEN
Larry J. Hicks and D. J. MacDonald Oct. 1973 14 p refs
(PB-225279/9GA; BM-RI-7841) Avail: NTIS HC $2.75 CSCL 07D

The catalytic activity of rare earth compounds is investigated to develop a catalyst for the cathode reaction of a hydrogen oxgen fuel cell. This report presents the results of studies of the catalytic activities of lanthanide oxides for the oxidation of hydrogen at 150 to 250 C. Preliminary activity tests were made with approximately stoichiometric mixtures of hydrogen and oxygen diluted with helium. A series of tests was also run under oxygen-rich conditions in which specific rate constants and activation energies were determined. (Modified author abstract) GRA

N74-17882# Radio Corp. of America, Princeton, N.J.
BOLOMETRIC POLYMER LAYERS Final Report, 1 Dec. 1972 - 15 Oct. 1973
A. William Stephens, Aaron W. Levine, and P. David Southgate Nov. 1973 65 p refs
(Contract DAAK02-73-C-0040; DA Proj. 1T0-61102-A-318)
(AD-771113; PRRL-73-CR-59) Avail: NTIS CSCL 07/3

The objective of this program was to synthesize polymeric materials of high pyroelectric efficiency and to prepare thin test films suitable for use in pyroelectric vidicons. Five atactic 4-substituted styrenes, were synthesized and evaluated, as were three isotactic 4-substituted styrenes. Their lack of pyroelectric effect was attributed to the helical structure of the substituted styrenes and the resultant lack of a net permanent dipole. Laser evaporation was found to be a very useful method of fabricating polymer thin films. Laser-evaporated poly(vinyl fluoride) exhibited a significant pyroelectric coefficient. A study of the basic mechanisms of pyroelectric polymer behavior was conducted and a model developed. Polarization processes and annealing behavior are also discussed. (Modified author abstract) GRA

N74-17883# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE REGULARITY OF MACROMOLECULES DURING THE MOLDING OF FIBERS FROM SOLUTION OF RIGID-CHAIN POLYMERS
S. P. Papkov 10 Dec. 1973 20 p refs Transl. into ENGLISH from Khim. Volokna (Leningrad), no. 1, 1973 p 3-6
(AD-772011; FTD-HT-23-813-74) Avail: NTIS CSCL 07/3

Transition to the anisotropic state during melting of hydrated cellulose fibers takes place within the liquid crystalline phase. The arrangement of the macromolecules is determined by the liquid thermodynamic behavior of the polymers when they are reworked during the molding process. G.G.

N74-17884# Aerospace Corp., El Segundo, Calif. Lab. Operations.
MONTE CARLO CALCULATIONS OF REACTION RATES AND ENERGY DISTRIBUTION AMONG REACTION PRODUCTS H + F2 TO HF + F + D + F1 TO DF + F
Roger L. Wilkins 3 Dec. 1973 30 p refs

(Contract F04701-73-C-0074)
(AD-771769; TR-0074(4530)-1; SAMSO-TR-73-386) Avail: NTIS CSCL 07/4

A three-dimensional classical trajectory calculation is made of the collision dynamics of the exothermic reactions H + F2(v,J) to HF(v,J) + F and D + F2(v,J) to DF(v,J) + F by means of a modified London-Eyring-Polanyi-Sato (LEPS) potential energy surface. Trajectory calculations are used to establish the anti-Morse interaction potentials for the first repulsive states of HF and F2. Reaction rate constants are presented for reaction directly into specific vibrational states of HF and DF. The initial product vibrational energy distribution of hydrogen fluoride is discussed. (Modified author abstract) GRA

N74-17831 Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF METHYL ALCOHOL FROM CARBON DIOXIDE AND HYDROGEN FOR REPRODUCING ARTIFICIAL SUGARS
M. G. Rozenfeld, M. T. Rusov, S. K. Sachenko, and Yu Ye. Sinyak *In its* Space Biol. and Aerospace Med. Vol. 8, No. 1, 1974 (JPRS-61487) 15 Mar. 1974 p 67-74 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 1, 1974 p 47-53 (For availability see N74-17822 09-04)

N74-18572 Joint Publications Research Service, Arlington, Va.
CHEMICAL ENGINEERING AND BASIC RESEARCH
N. M. Zhavoronkov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 40-47 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 32-36 (For availability see N74-18567 09-34)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-17885* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MULTIFUNCTION AUDIO DIGITIZER Patent
Leo G. Monford, Jr., inventor (to NASA) Issued 5 Mar. 1974 5 p Filed 9 Nov. 1971 Supersedes N72-20157 (10 - 11, p 1439)
(NASA-Case-MSC-13855-1; US-Patent-3,795,900; US-Patent-Appl-SN-196931; US-Patent-Class-340-347AD; US-Patent-Class-325-38B; US-Patent-Class-332-11D) Avail: US Patent Office CSCL 17B

An illustrative embodiment of the invention includes apparatus which simultaneously produces both direct delta modulation and pulse code modulation. An input signal, after amplification, is supplied to a window comparator which supplies a polarity control signal to gate the output of a clock to the appropriate input of a binary up-down counter. The control signals provide direct delta modulation while the up-down counter output provides pulse code modulation.
Official Gazette of the U.S. Patent Office

N74-17886# Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
DIVISION OF RADIOPHYSICS RESEARCH ACTIVITIES 1973
25 Jun. 1973 38 p
Avail: NTIS HC $5.00

Activities in cosmic and solar research are reported. The topics of radio astronomy discussed include: (1) studying the Universe with radio waves, (2) interstellar radio spectroscopy, (3) mapping the Milky Way, (4) supernova remnants and planetary nebulae, (5) pulsars, and (6) radio bursts in the corona. F.O.S.

N74-17887*# Radio Corp. of America, Moorestown, N.J. Missile and Surface Radar Div.
A PRELIMINARY INVESTIGATION OF BIRD CLASSIFICATION BY DOPPLER RADAR
Lloyd W. Martinson 20 Feb. 1973 37 p refs
(NASA Order P-52456)
(NASA-CR-137457) Avail: NTIS HC $5.00 CSCL 17I

A preliminary study of the application of Doppler radar to the classification of birds is reported. The desirability for improvements in bird classification stems primarily from the hazards they present to jet aircraft in flight and in the vicinity of airports. A secondary need exists in the study of bird migration. The wing body and tail motion of a bird in flight reflect signals which, when analyzed properly present a signature of wing beat pattern which is unique for each bird species. Although the results of this investigation did not validate the feasibility of classifying bird species, they do indicate that a more thorough investigation is warranted. Certain gross characteristics such as wing beat rates, multiple bird patterns, and bird maneuverability, were indicated clearly in the results. Large birds with slow wing beat rates appear to be the most optimum subject for further study with the X-band Doppler radar used in this investigation.
Author

N74-17888*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DIGITAL TRANSMITTER FOR DATA BUS COMMUNICATIONS SYSTEM Patent Application
George Eugene Proch, inventor (to NASA) (Lockheed Electron. Co.) Filed 27 Dec. 1973 19 p
(Contract NAS9-12200)
(NASA-Case-MSC-14558-1; US-Patent-Appl-SN-428994) Avail: NTIS HC $4.00 CSCL 17B

An improved digital transmitter for transmitting serial pulse code modulation (pcm) data at high bit rates over a transmission line is described. When not transmitting, the transmitter features a high output impedance which prevents the transmitter from loading the transmission line. The pcm input is supplied to a logic control circuit which produces two discrete logic level signals which are supplied to an amplifier. The amplifier, which is transformer coupled to the output isolation circuitry, converts the discrete logic level signals to two high current level, ground isolated signals in the secondary windings of the coupling transformer. The latter signals are employed as inputs to the isolation circuitry which includes two series transistor pairs operating into a hybrid transformer functioning to isolate the transmitter circuitry from the transmission line. An effective increased amplitude, balanced, differential output signal is produced by the transmitter from the serial pcm input data to provide an improved transmitted signal on the transmission line.
NASA

N74-17889# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE QUESTION OF THE INTERFERENCE-IMMUNITY OF OPTICAL-BAND SIGNAL RECEPTION IN A CHANNEL WITH FADING
Iu. A. Goldshtein, V. I. Emin, and I. G. Frishman [1973] 3 p refs Transl. into ENGLISH from Radiotekh. i Elektron. (Moscow), v. 18, no. 10, 1973 p 2176-2179
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

Fading of waves in the optical band is described mainly by two distribution laws, the logarithmic, normal and generalized Raleigh laws. Both are well approximated by an m-distribution, which is also used to describe the statistical properties of the transmission coefficient in each diversity branch. It is shown that two diversity channels permit assurance of reception interference immunity equal to or exceeding the interference immunity of single reception without fading for fading subject to the m-distribution law with parameter m on the order of two to three. This latter is explained by the effect of cumulative noise and is associated with the singularities of a signal estimated by a Poisson distribution for which the interference immunity of the reception depends on the noise level as well as on the signal-to-noise ratio.
Author

N74-17890# Rome Univ. (Italy). Inst. of Physics.
IMPROVEMENT OF THE RESOLVING POWER OF A TV SYSTEM FOR PULSED IMAGES
F. Cesaroni, U. Florean, and M. Severi 5 Oct. 1973 7 p refs Prepared jointly with Istituto Nazionale di Fisica Nucleare,

Rome
(NOTA-Interna-496) Avail: NTIS HC $4.00

The resolving power as well as the signal to noise ratio of a TV system can be improved by reducing the scanning speed of the electron beam on the sensitive target of the TV tube. This result was obtained with continuously illuminated test patterns. The experiment was carried out to develop a TV system for recording luminous images produced by nuclear instruments and lasting much less than a single scanning line. ESRO

N74-17891# Admiralty Surface Weapons Establishment, Portsmouth (England).
A COMPUTER PROGRAM FOR EVALUATING THE FAR-FIELD RADIATION PATTERN OF AN OMNI-DIRECTIONAL ANTENNA OBSTRUCTED BY A VERTICAL METAL CYLINDER
T. J. Green Sep. 1973 18 p refs
(TR-73-27; BR37572) Avail: NTIS HC $4.00

The degrading effects of cylindrical metal obstructions on the far-field radiation pattern of an omnidirectional antenna, vertically or horizontally polarized were investigated. A description is given of a computer program to evaluate the far-field radiation pattern of such a system. The program is written in FORTRAN for use on Com-Share Commander 2 time sharing facility.
Author (ESRO)

N74-17892# Admiralty Research Lab., Teddington (England).
THE GAIN OF STEERED SONAR ARRAYS
P. J. Enoch Mar. 1973 26 p refs
(ARL/L/N-217; BR37280) Avail: NTIS HC $4.50

Two methods of calculating the gain of an array in simple and complex noise fields are presented. One method approaches the solutions from a knowledge of the spatial correlation of the noise, the other from a knowledge of the directivity pattern of the array. It is shown that the gain of an array varies as the response is steered unless the noise is omnidirectional and all interelement distances are exact integer multiples of a half-a-wavelength, when the gain is constant at a value of 10 log N. However these gain variations reduce as the number of elements is increased until with fifty elements the gain is effectively constant over a 60 deg sector either side of the broadside position. Examples are given of linear and planar arrays in both types of noise field. Author (ESRO)

N74-17893# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
FURTHER MEASUREMENTS ON SATELLITE-LINK FADING AT LOW ALTITUDES ABOVE IRREGULAR TERRAIN
J. Hortenbach Oct. 1973 22 p refs Reprinted from Proc. 16th Symp. on Tactical Satellite Commun. (The Hague) 19 Sep. 1973 p 25-43
(Contract T-0230-92320-91345)
(Rept-4-73) Avail: NTIS HC $4.25

Fading characteristics of low altitude helicopter to satellite links were measured. Data evaluation comprises level crossing rates, probability distribution functions, average duration of fades, and envelope spectra for horizontal and vertical polarization. Some phenomena typical for low altitudes are described. ESRO

N74-17894# Technology Service Corp., Santa Monica, Calif.
ADAPTIVE AMTI RADAR Final Report, 1 Jul. - 30 Sep. 1973
Lawrence E. Brennan and John D. Mallett 19 Oct. 1973 29 p refs
(Contract N00019-73-C-0093)
(AD-771385; TSC-PD-096-4) Avail: NTIS CSCL 17/9

Adaptive signal processing in airborne radars with array antennas can provide a high level of MTI performance, including automatic platform motion compensation. Methods of simplifying adaptive AMTI radars by forming subarray outputs and adding these subarray outputs adaptively are described and evaluated in this report. It is shown that in radars with many-element arrays, e.g., AI radars, ground AMTI performance can be achieved in systems with roughly nine subarray outputs from the antenna. The results obtained during the preceding three quarters of the study are summarized in this final report, and relate to the performance of space-time adaptive radar in non-uniform clutter, conformal array antennas in adaptive AMTI radar, and a method of achieving rapid convergence in adaptive systems.
Author (GRA)

N74-17895# Mitre Corp., Bedford, Mass.
STEREOGRAPHIC PROJECTION OF RADAR DATA IN A METTED RADAR SYSTEM
J. J. Burke Nov. 1973 58 p refs
(Contract F19628-73-C-0001; AF Proj. 4510)
(AD-771544; MTR-2580; ESD-TR-73-210) Avail: NTIS CSCL 17/9

The processing of data from a netted radar system may conveniently be described in terms of the conversion of radar data into rectangular coordinates in a plane with the radar site as origin and the transformation of these coordinates into rectangular coordinates in the plane of a common system of coordinates. The report focuses on the transformation aspect of the stereographic projection and completely derives the transformation equation both in complex notation and in terms that are suitable for real time computation. Contours of constant distortion induced by the projection process are presented. The effect of the choice of an earth's radius upon the distortion is quantitatively examined. Finally, the complete stereographic conversion and transformation equations are summarized. Author (GRA)

N74-17896# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
RECONFIGURATION OF SPECIFIC LINE-OF-SIGHT LINKS TO 15 GHz
L. G. Hause and C. A. Samson Oct. 1973 34 p refs Sponsored by Army Commun. Command, Ft. Huachuca, Ariz.
(AD-771181; ACC-ACO-7-73) Avail: NTIS CSCL 17/2

Three existing 8 GHz microwave links in Germany were analyzed to determine the feasibility of converting them to operation at 15 GHz. The greatly increased attenuation at 15 GHz during heavy rainfall is the major factor to be considered.
Author (GRA)

N74-17897# California Univ., Los Angeles. School of Engineering and Applied Science.
EFFECTIVENESS OF ORTHOGONAL TRANSFORMS IN INFORMATION PROCESSING APPLICATIONS Final Report, 1 Oct. 1971 - 30 Sep. 1973
Judea Pearl Nov. 1973 14 p
(Contract N00014-69-A-0200-4038)
(AD-771328; UCLA-ENG-7387) Avail: NTIS CSCL 09/4

The effectiveness of using orthonormal transform methods in digital signal processing application was analyzed. (1) Standard tools and analytic measures for comparing the performance of orthonormal transforms under specified as well as partially known statistics are developed for data filtering and coding. (2) Signal uncertainty relations are generalized to cover discrete as well as non-trigonometric transforms. (3) The effectiveness of Fourier and Walsh transforms is compared for radar velocity estimation and target detection. (4) The discrete Fourier transform is proved to be asymptotically performance degradation due to residual cross-correlation among Fourier coefficients are developed for finite N. (5) Necessary and sufficient conditions for two transforms to be asymptotically equivalent are developed and bounds on the worst case performance difference are derived.
Author (GRA)

N74-17898# Signatron, Inc., Lexington, Mass.
RECEIVER CANONIC MODELS Technical Report, 8 Mar. - 7 Jun. 1973
J. N. Pierce, J. W. Graham, and J. J. Bussgang Oct. 1973 61 p refs
(Contract F30602-73-C-0206)
(AD-771540; RADC-TR-73-313) Avail: NTIS CSCL 17/2

The necessary background material for understanding of canonic models of nonlinear communication receiver circuits is presented. Fundamentals of Volterra analysis including the difference between the infinite Volterra series and the finite Volterra approximations are given. The nonlinear transfer functions together with basic principles for their measurement are introduced. The crux of canonic modeling of circuits with narrowband inputs is given for linear circuits as an introduction to the corresponding development for nonlinear circuits.
Author (GRA)

N74-17899# Rome Air Development Center, Griffiss AFB, N.Y.
THE APPLICATION OF SEQUENTIAL CODE REDUCTION
Frederick D. Schmandt Oct. 1973 99 p refs
(AD-771587; RADC-TR-73-318) Avail: NTIS CSCL 09/4

The concept of sequential code reduction (SCR), a new decoding concept devised by Drs. Luther D. Rudolph and Carlos R. P. Hartmann of Syracuse University, is used to achieve significant circuitry reductions in comparison to previous decoder implementations for a number of codes. For short block length codes the benefit is economy. For moderate to very long block lengths a sequential code reduction decoder may very well be the most cost effective or only solution to a communication problem. In addition to deriving basic SCR configurations, the author illustrates how easily the concepts of SCR and weighted erasure decoding (WED) can be combined to form a technique of decoding which uses likelihood information. Author (GRA)

N74-17900# Maryland Univ., College Park. Computer Science Center.
PATTERN ANALYSIS, MODELING AND CLASSIFICATION Interim Scientific Report, 1 Sep. 1972 - 31 Aug. 1973
Laveen Kanal 29 Oct. 1973 34 p refs
(Grant AF-AFOSR-1982-71; AF Proj. 9769)
(AD-771534; AFOSR-73-2201TR) Avail: NTIS CSCL 09/4

General purpose techniques for pattern analysis, modeling and classification are being developed under grant AFOSR 71-1982. These techniques are being applied to practical problems in digital communications and the machine recognition of spatial and temporal patterns in waveforms and images derived from sensors. The objective of this effort is to enable more efficient use of existing data communication equipment and permit the design of superior communication networks and the automatic classification of sensor data. (Modified author abstract) GRA

N74-17901# Massachusetts Inst. of Tech., Cambridge.
PACKET COMMUNICATION Ph.D. Thesis - Harvard Univ., May 1973 Interim Scientific Report
Robert Melancton Metcalfe Dec. 1973 243 p refs
(Contract N00014-70-A-0362-0006; ARPA Order 2095; Proj. MAC)
(AD-771430; NAC-TR-114) Avail: NTIS CSCL 17/2

Experience with, analysis of, and exposition on contemporary computer communication networks, including particularly the ARPA Computer Network and the ALOHA System, are combined and presented to expose the unifying influence of packet-switching in the application of computers in communication systems and in the organization of distributed computing systems.
Author (GRA)

N74-17902# Naval Electronics Lab. Center, San Diego, Calif.
FIBER AND INTEGRATED OPTIC COMMUNICATION TECHNOLOGY Research and Development Report, 1 Oct. 1972 - 31 Mar. 1973
W. E. Martin and D. J. Albares 24 Aug. 1973 42 p refs
(ARPA Order 2158)
(AD-771402; NELC-TR-1891) Avail: NTIS CSCL 17/2

Applications assessment studies and a preliminary cost-benefit analysis are performed which indicate areas of definite performance gains and cost savings from use of fiber-optic and integrated-optical-circuit (IOC) technologies, particularly in avionics systems. Progress in fiber optics, which has made possible the use of conventional off-the-shelf components in proposed systems with immediate applications, is shown. Progress is also shown in IOC technology, particularly in modulators for use in proposed high-bandwidth systems. Several unique IOC devices are investigated which promise to have the capability to use extremely-wide-bandwidth optical waveguides. Author (GRA)

N74-17903# Signatron, Inc., Lexington, Mass.
TACTICAL TROPO EVALUATION CRITERIA Final Report, Feb. 1972 - Jun. 1973
Leonard Ehrman, Edward H. Getchell, and James W. Graham
Nov. 1973 102 p refs
(Contract F30602-72-C-0223)
(AD-771791; SIG-A-139; RADC-TR-73-323) Avail: NTIS CSCL 17/2

A study has been made of the use of a dynamic troposcatter channel simulator as a means of evaluating FDM/FM troposcatter radio equipment. A quadruple diversity simulator was built, and both laboratory and link tests were performed. It is shown that by using the simulator the effects of receiver noise, received power level, path dispersion, modulation parameters, diversity combiners, and radio equipment limitations can be separated and evaluated individually. Measured and theoretically predicted values of intermodulation noise are found to be in good agreement. It is concluded that a simple channel simulator provides a realistic and effective means of evaluating FDM/FM troposcatter radio equipment. Author (GRA)

N74-17904# Texas Univ., Austin. Applied Research Labs.
FREQUENCY MIXING OF ELECTROMAGNETIC WAVES IN PLASMAS BY COLLISIONAL PROCESSES
James R. Clynch Dec. 1973 172 p refs
(Contract N00014-70-A-0166-0008; NR Proj. 240-014)
(AD-771442; ARL-TR-73-27) Avail: NTIS CSCL 20/14

The problem of calculating the scattered electromagnetic radiation at mixed frequencies when two or more electromagnetic waves pass through a plasma is considered. The Boltzmann equation for the spherical moments of the electron distribution function is obtained and solved in the perturbative limit. A system of diagrams is developed to enable easy identification and calculation of all terms of a given order. The nonlinear currents at the frequency (omega sub 1) - (omega sub 2) induced by parallel pencil beams of linearly and circularly polarized waves are calculated. The current at the frequency (omega sub 1) - (omega sub 2) is calculated for the case of perpendicular propagation of the initial waves. (Modified author abstract) GRA

N74-17905# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BOOK OF PROBLEMS OF RADAR
V. V. Vasin and B. M. Stepanov 29 Nov. 1973 220 p refs
Transl. into ENGLISH of the book "Zadachnik po Radiolokatsii" USSR, 1969 p 1-178
(AD-771650; FTD-MT-24-194-74) Avail: NTIS CSCL 17/9

The book contains 184 problems on the most important problems of radar: the detection of signals, their resolution and the accuracy of measurement of the parameters. A feature of the book is the contemporary statistical treatment of the indicated problems. GRA

N74-17906# SACLANT ASW Research Center, La Spezia (Italy). Theoretical Studies Group.
COMPARATIVE STUDY OF VARIOUS SCHEMES USED FOR DETECTING RANDOM SIGNALS WITH UNKNOWN TIME OF ARRIVAL AND UNKNOWN DURATION
Gian Paolo Drago and Christian Fabry 1 Dec. 1973 21 p refs
(AD-771447; SACLANTCEN-SM-35) Avail: NTIS CSCL 09/4

A simulation study was made to compare the performances of various schemes used for detecting Gaussian signals of unknown time of arrival and unknown duration. Such signals could represent, for instance, the output of a matched filter when the echo received is produced by a target whose length is large compared with the range resolution of the transmitted signal.
Author (GRA)

N74-17907# Signatron, Inc., Lexington, Mass.
ANALYSIS OF NONLINEAR SYSTEMS WITH MULTIPLE INPUTS Final Report, Apr. 1970 - Jun. 1973
Julian J. Bussgang, Leonard Ehrman, and J. William Graham
Nov. 1973 155 p refs
(Contract F30602-70-C-0008)
(AD-771802; RADC-TR-73-324) Avail: NTIS CSCL 17/2

The report summarizes results of an extensive theoretical and experimental effort entitled Communication Receivers Interference Modeling. The objective of the contract was to develop reliable, realistic, and useful mathematical models of the response of communication receivers to multiple input signals. Part 1 presents the Wiener-Volterra method of analysis of nonlinear circuits applicable to small signal excitations. A powerful method of obtaining nonlinear transfer functions of nonlinear circuits and systems from circuit diagrams is explained. A nonlinear network analysis computer program called SIGNCAP was prepared that embodies the method. Part 2 applies this method to the prediction of behavior of communication receivers in the presence

of interference. Many measurement examples abstracted from the book illustrate the method. (Modified author abstract) GRA

N74-18479* Geological Survey, Washington, D.C.
CALIBRATION OF RADAR DATA FROM APOLLO 17 AND OTHER MISSION RESULTS
H. J. Moore and S. H. Zisk (MIT) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 7 p refs (For availability see N74-18428 09-30)
CSCL 17I

N74-18480* Geological Survey, Washington, D.C.
COMPARISON BETWEEN PHOTOGRAMMETRIC AND BISTATIC-RADAR SLOPE FREQUENCY DISTRIBUTIONS
H. J. Moore and G. L. Tyler (Stanford Univ.) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 17I

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-17908 Newcastle-upon-Tyne Univ. (England). Computing Lab.
AN ANALYTIC STORAGE ALLOCATION MODEL
T. Betteridge Mar. 1973 39 p refs
(TR-43) Copyright. Avail: Issuing Activity

An analytical model of a simple computer storage allocation scheme is described, and its Markov nature established, given certain conditions on its input and operation. Simple Markov theory is used to compute the expected storage utilization in some example situations with small memory sizes. These are compared with the analytical closed-form results when storage relocation is allowed. Some current restrictions and possible future developments and uses of the model are outlined. Author

N74-17909*# Stanford Research Inst., Menlo Park, Calif.
DESIGN OF A FAULT TOLERANT AIRBORNE DIGITAL COMPUTER. VOLUME 1: ARCHITECTURE Final Report
J. H. Wensley, K. N. Levitt, M. W. Green, J. Goldberg, and P. G. Neumann Oct. 1973 187 p refs
(NASA-CR-132252) Avail: NTIS HC $12.50 CSCL 09B

This volume is concerned with the architecture of a fault tolerant digital computer for an advanced commercial aircraft. All of the computations of the aircraft, including those presently carried out by analogue techniques, are to be carried out in this digital computer. Among the important qualities of the computer are the following: (1) The capacity is to be matched to the aircraft environment. (2) The reliability is to be selectively matched to the criticality and deadline requirements of each of the computations. (3) The system is to be readily expandable, contractible, and (4) The design is to appropriate to post 1975 technology. Three candidate architectures are discussed and assessed in terms of the above qualities. Of the three candidates, a newly conceived architecture, Software Implemented Fault Tolerance (SIFT), provides the best match to the above qualities. In addition SIFT is particularly simple and believable. The other candidates, Bus Checker System (BUCS), also newly conceived in this project, and the Hopkins multiprocessor are potentially more efficient than SIFT in the use of redundancy, but otherwise are not as attractive. Author

N74-17910*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRCMACS: AN EXTENSIVE SET OF MACROS FOR STRUCTURED PROGRAMMING IN OS/360 ASSEMBLY LANGUAGE
C. Wrandle Barth Jan. 1974 241 p refs
(NASA-TM-X-70599; X-603-74-34) Avail: NTIS HC $15.25 CSCL 09B

Two techniques are discussed that have been most often referred to as structured programming. One is that of programming with high level control structures (such as the if and while) replacing the branch instruction (goto-less programming); the other is the process of developing a program by progressively refining descriptions of components in terms of more primitive components (called stepwise refinement or top-down programming). In addition to discussing what these techniques are, it is shown why their use is advised and how both can be implemented in OS assembly language by the use of a special macro instruction package. Author

N74-17911*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SHARED MEMORY FOR A FAULT-TOLERANT COMPUTER Patent Application
George C. Gilley, inventor (to NASA) (JPL) Filed 31 Aug. 1973 22 p
(Contract NAS7-100)
(NASA-Case-NPO-13139-1; US-Patent-Appl-SN-393524) Avail: NTIS HC $4.25 CSCL 09B

A system for sharing a memory in a fault-tolerant computer is described. The memory is under the direct control and monitoring of error detecting and error diagnostic units in the fault-tolerant computer. This computer, for example, verifies that data to and from the memory is legally encoded and verifies that words read from the memory at a desired address are, in fact, actually delivered from that desired address. The invention provides the means for a second processor, which is independent of the direct control and monitoring of the error checking and diagnostic units of the fault-tolerant computer, to share the memory of the fault-tolerant computer and includes circuitry to verify that: (1) The processor has properly accessed a desired memory location in the memory. (2) A data word read out from the memory is properly coded. (3) No inactive memory was erroneously outputting data onto the shared memory bus. NASA

N74-17912*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CHOICE: 36 BAND FEATURE SELECTION SOFTWARE WITH APPLICATIONS TO MULTISPECTRAL PATTERN RECOGNITION
W. C. Jones [1973] 74 p refs
(NASA-TM-X-69926; ERL-059) Avail: NTIS HC $6.75 CSCL 09B

Feature selection software was developed at the Earth Resources Laboratory that is capable of inputting up to 36 channels and selecting channel subsets according to several criteria based on divergence. One of the criterion used is compatible with the table look-up classifier requirements. The software indicates which channel subset best separates (based on average divergence) each class from all other classes. The software employs an exhaustive search technique, and computer time is not prohibitive. A typical task to select the best 4 of 22 channels for 12 classes takes 9 minutes on a Univac 1108 computer. Author

N74-17913*# Autonetics, Anaheim, Calif.
TRIPLE REDUNDANT COMPUTER SYSTEM/DISPLAY AND KEYBOARD SUBSYSTEM INTERFACE Final Report
F. J. Gulde 31 Jul. 1973 38 p
(Contract NAS9-12876)
(NASA-CR-134203; C73-692/201) Avail: NTIS HC $5.00 CSCL 09B

Interfacing of the redundant display and keyboard subsystem with the triple redundant computer system is defined according to space shuttle design. The study is performed in three phases: (1) TRCS configuration and characteristics identification; (2) display and keyboard subsystem configuration and characteristics identification, and (3) interface approach definition. Author

N74-17914*# Alfred Univ., N.Y. Coll. of Ceramics.
CRYSTALLOGRAPHIC AND GENERAL USE PROGRAMS FOR THE XDS SIGMA 5 COMPUTER
Robert L. Snyder [1973] 143 p
(Contract NCAw-33-187-002)
(NASA-CR-137050) Avail: NTIS HC $10.25 CSCL 09B

Programs in basic FORTRAN 4 are described, which fall into three catagories: (1) interactive programs to be executed under time sharing (BTM); (2) non interactive programs which are executed in batch processing mode (BPM); and (3) large

non interactive programs which require more memory than is available in the normal BPM/BTM operating system and must be run overnight on a special system called XRAY which releases about 45,000 words of memory to the user. Programs in catagories (1) and (2) are stored as FORTRAN source files in the account FSNYDER. Programs in catagory (3) are stored in the XRAY system as load modules. The type of file in account FSNYDER is identified by the first two letters in the name.
Author

N74-17915*# Computer Sciences Corp., Silver Spring, Md.
IMAGE DISPLAY AND MANIPULATION SYSTEM (IDAMS) PROGRAM DOCUMENTATION, APPENDIXES A-D
R. W. Cecil, R. A. White, and M. R. Szczur Sep. 1972 385 p
(Contract NAS5-11723)
(NASA-CR-132916; Rept-5006-04000-02TR) Avail: NTIS HC $22.25 CSCL 09B

The IDAMS Processor is a package of task routines and support software that performs convolution filtering, image expansion, fast Fourier transformation, and other operations on a digital image tape. A unique task control card for that program, together with any necessary parameter cards, selects each processing technique to be applied to the input image. A variable number of tasks can be selected for execution by including the proper task and parameter cards in the input deck. An executive maintains control of the run; it initiates execution of each task in turn and handles any necessary error processing. Author

N74-17916*# Computer Sciences Corp., Silver Spring, Md.
IMAGE DISPLAY AND MANIPULATION SYSTEM (IDAMS), USER'S GUIDE
R. W. Cecil Sep. 1972 82 p
(Contract NAS5-11723)
(NASA-CR-132915; Rept-5006-04000-02TR) Avail: NTIS HC $7.25 CSCL 09B

A combination operator's guide and user's handbook for the Image Display and Manipulation System (IDAMS) is reported. Information is presented to define how to operate the computer equipment, how to structure a run deck, and how to select parameters necessary for executing a sequence of IDAMS task routines. If more detailed information is needed on any IDAMS program, see the IDAMS program documentation. Author

N74-17917# Cranfield Inst. of Technology (England). Computing Centre.
THE DESIGN OF CASCADED DIGITAL RECURSIVE FILTERS USING THE BILINEAR TRANSFORM
K. G. Beauchamp and M. E. Williamson Jul. 1971 31 p refs
(Cranfield-Memo-41) Avail: NTIS HC $4.75

The derivation of the equations used in a computer program DESF are given. The program carries out the calculations required for evaluation of recursive digital filter coefficients and operates on the applied data to give a filtered output data series. Charts are included to permit plotting of the designed filter frequency and phase characteristics. Author

N74-17918# Joint Publications Research Service, Arlington, Va.
UNIFIED COMPUTER SYSTEM OF THE SOCIALIST COUNTRIES
Yu. A. Shmykov and R. I. Gogunov 4 Feb. 1974 12 p Transl. into ENGLISH from Pribory sistemy Upr. (Moscow), no. 9, 1973 p 4-7
(JPRS-61131) Avail: NTIS HC $4.00

A description is presented of the international exhibition of the unified system of electronic computers of socialist countries held in Moscow in May 1973. Author

N74-17919# Lockheed Missiles and Space Co., Palo Alto, Calif.
APPLICATION OF DIGITAL COMPUTERS TO ANALYZE AND SYNTHESIZE DISCRETE STABILIZATION SYSTEMS
V. D. Arens, S. M. Fedorov, M. S. Khitrik, and S. V. Luchko [1974] 31 p Transl. into ENGLISH from the book "Dinamika Sistem Upravleniia Raket s Bortovoi Tsifrovymi Vychislitelnymi Mashinami" Moscow, Mashinostr., 1972 p 180-219
Avail: NTIS HC $4.75; National Translations Center, John Crerar Library, Chicago, Illinois 60616

It is shown that the fundamental operations of computing discrete systems by frequency methods are supplied by algorithmization. They can easily be combined into a single program which automatically realizes the whole computation process.
Author

N74-17920# California Univ., Livermore. Lawrence Livermore Lab.
EISPACK USER'S GUIDE
R. P. Dickinson, Jr., F. N. Fritsch, R. F. Hausman, Jr., and R. F. Sincovec Sep. 1973 46 p refs
(Contract W-7405-eng-48)
(UCID-30077) Avail: NTIS HC $4.50

The EISPACK is a collection of subroutines, written in ANSI standard FORTRAN, designed to compute the eigenvalues and eigenvectors for a variety of matrix problems. These codes, which will be periodically updated, form a complete eigensystem package, are representative of the state of the art in speed and accuracy, and have been thoroughly tested and certified. This report is intended to simplify the task of determining which of the routines are to be used for solving the particular problem at hand.
Author (NSA)

N74-17921# Air Force Armament Lab., Eglin AFB, Fla.
USERS MANUAL FOR STICM (THE STODOLA IN-CORE MATRIX): AN IN-CORE MATRIX OPERATIONS COMPUTER PROGRAM Final Report, Mar. 1970 - Jan. 1971
Robert W. Bunton Sep. 1973 40 p ref
(AF Proj. 2567)
(AD-770999; AFATL-TR-73-186) Avail: NTIS CSCL 09/2

The STodola In-Core Matrix (STICM) operator is an in-core matrix manipulation computer program which uses a modified STodola method to solve for real eigensolutions. The basic input concepts and many of the matrix operations in STICM are borrowed from the random MATrix OPerations (MATOP) program but STICM is specifically tailored to perform aircraft vibrations on a production basis. Author (GRA)

N74-17922# Ohio State Univ., Columbus. Computer and Information Science Research Center.
AUTOMATIC PROGRAM SYNTHESIS REPORTS. 1. SPEEDING UP A PROGRAM SYNTHESIZER. 2. A SYSTEM FOR PROGRAM SYNTHESIS FROM EXAMPLES
Alan W. Biermann, Richard Baum, Frederick E. Petry, and R. Krishnaswamy Oct. 1973 66 p refs Prepared in cooperation with Stanford Univ.
(Grants NSF GN-534-1; NSF GJ-34739; NSF GJ-776)
(AD-771332; OSU-CISRC-TR-73-6) Avail: NTIS CSCL 09/2

An algorithm is given for synthesizing a computer program from a trace of its behavior. Since the algorithm involves a search, the length of time required to do the synthesis of nontrivial programs can be quite large. Techniques are given for preprocessing the trace information to reduce enumeration, for pruning the search using a failure memory technique, and for using multiple traces to the best advantage. The results of numerous tests are given to demonstrate the value of the techniques. Author (GRA)

N74-17923# Naval Electronics Lab. Center, San Diego, Calif.
MICROPROCESSOR DEVELOPMENTS FOR PROJECT 2175 Research and Development Report, 1 Jul. 1972 - 30 Jun. 1973
Richard V. Keele and Gary R. Stephenson 7 Aug. 1973 184 p refs
(ZF54545001)
(AD-771382; NELC-TR-1882) Avail: NTIS CSCL 09/2

Microprocessors currently available have been examined in detail and found to have the capability of replacing special function logic modules and of performing as multiprocessors. The feasibility of partitioning microprocessors onto the Project 2175 card was demonstrated. It was shown that this form factor did not pose significant problems in the design of two systems. The capability for quick and easy design using microprocessors has been shown to be possible through (1) a family of standard microprocessing modules, (2) a computer-generated backplane wire list, and (3) a software operating system for reducing software development time. From systems examined in detail using microprocessors it was shown that the use of these standard processor modules

will decrease system development time, decrease cost and increase performance, reliability, and maintainability. GRA

N74-17924# Westinghouse Research Labs., Pittsburgh, Pa.
MOBILE CENTRAL SWITCHES (AN ELECTRON-LITHOGRAPHY APPLICATION) Final Report, 9 Jun. 1969 - 30 Jun. 1972
Paul R. Malmberg, Terrence W. OKeeffe, Michael M. Sopira, and Luciano C. Scala Sep. 1973 301 p
(Contract F30602-69-C-0280; AF Proj. 4519; AF Proj. 6523) (AD-771545; Rept-6F6-LSMEM-R1; RADC-TR-73-275) Avail: NTIS CSCL 09/2

Maximum density circuit fabrication techniques were applied to the fabrication of a 1024-bit random access memory based on a 2-transistor versatile memory/crosspoint switch cell of RADC design. Arranged as a 32 word by 32 bit matrix of cells on 20 x 24 micron centers, the memory chip design includes address decoding for selective enabling of three control busses per word to permit operation of the device as a random access memory, associative memory, crosspoint switch, or sample and hold switch. A two micron minimum geometry design rule was followed. Fourteen memory circuits and 4 test circuits were completed and the best units were mounted on ceramic carriers with 50-pin edge connectors. Static and dynamic tests of these devices showed operating transistors, decoders, and a memory word used for reset of data lines. Electron beam fabrication techniques were advanced during the program. (Modified author abstract) GRA

N74-17925# Illinois Univ., Urbana. Dept. of Computer Science.
DESIGN OF TOTALLY SELF-CHECKING ASYNCHRONOUS SEQUENTIAL MACHINES M.S. Thesis
Daniel Avery Pitt Sep. 1973 39 p refs
(PB-224540/5GA; UIUCDCS-R-73-593) Avail: NTIS HC $4.00 CSCL 09B

Techniques have been developed for designing asynchronous machines that indicate faults by assuming error states. Design methods have also been found for the construction of self checking combinational networks which indicate errors either in their coded inputs or in their own circuitry. The paper presents a means of uniting these two methods to yield asynchronous sequential machines which are self checking. The problems inherent in the individual design procedures for the two methods as well as those which arise in making the two methods compatible are discussed. GRA

N74-17926# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF CERTAIN GEOMETRIC PARAMETERS OF COMPLEX SURFACES ON URAL-4 COMPUTER
S. M. Zamalin 10 Dec. 1973 20 p refs Transl. into ENGLISH from Samolectostr. Tekh. Vozdush. Flota (USSR), no. 25, 1971 p 61-69
(AD-772040; FTD-HT-23-180-74) Avail: NTIS CSCL 09/2

When calculating and reproducing the external shapes of aircraft, it is necessary to solve a large number of geometric problems. The paper presents computer applications to these geometric problems. GRA

N74-18620 Joint Publications Research Service, Arlington, Va.
STATUS OF PLANS FOR TRAINING OF COMPUTER PERSONNEL DETAILED
Lajos Pomazi *In its* Transl. on Eastern Europe: Sci. Affairs, No. 386 (JPRS-61213) 13 Feb. 1974 p 4-17 Transl. into ENGLISH from Felsooktatasi Szemle (Budapest), no. 12, 1973 p 717-726 (For availability see N74-18619 09-34)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-17927* National Aeronautics and Space Administration. Pasadena Office, Calif.
SYSTEM FOR STABILIZING CABLE PHASE DELAY UTILIZING A COAXIAL CABLE UNDER PRESSURE Patent
Philip A. Clements, inventor (to NASA) (JPL) Issued 5 Feb. 1974 7 p Filed 23 Feb. 1973 Supersedes N73-20238 (11 - 11, p 1262) Sponsored by NASA
(NASA-Case-NPO-13138-1; US-Patent-3,790,906; US-Patent-Appl-SN-335201; US-Patent-Class-333-16; US-Patent-Class-328-155; US-Patent-Class-333-18) Avail: US Patent Office CSCL 09A

Stabilizing the phase delay of signals passing through a pressurizable coaxial cable is disclosed. Signals from an appropriate source at a selected frequency, e.g., 100 MHz, are sent through the controlled cable from a first cable end to a second cable end which, electrically, is open or heavily mismatched at 100 MHz, thereby reflecting 100 MHz signals back to the first cable end. Thereat, the phase difference between the reflected-back signals and the signals from the source is detected by a phase detector. The output of the latter is used to control the flow of gas to or from the cable, thereby controlling the cable pressure, which in turn affects the cable phase delay.
Official Gazette of the U.S. Patent Office

N74-17928* National Aeronautics and Space Administration. Pasadena Office, Calif.
BANDED TRANSFORMER CORES Patent
William T. McLyman, inventor (to NASA) Issued 12 Feb. 1974 8 p Filed 28 Aug. 1972 Supersedes N73-22150 (11 - 13, p 1499)
(NASA-Case-NPO-11966-1; NASA-Case-NPO-13159-1; US-Patent-3,792,399; US-Patent-Appl-SN-284245; US-Patent-Class-336-210; US-Patent-Class-100-8) Avail: US Patent Office CSCL 09E

A banded transformer core formed by positioning a pair of mated, similar core halves on a supporting pedestal. The core halves are encircled with a strap, selectively applying tension whereby a compressive force is applied to the core edge for reducing the innate air gap. A dc magnetic field is employed in supporting the core halves during initial phases of the banding operation, while an ac magnetic field subsequently is employed for detecting dimension changes occurring in the air gaps as tension is applied to the strap.
Official Gazette of the U.S. Patent Office

N74-17929* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OVERVOLTAGE PROTECTION NETWORK Patent
Joseph M. Cambra, inventor (to NASA) Issued 5 Mar. 1974 5 p Filed 29 Nov. 1972 Supersedes N73-29124 (11 - 20, p 2380)
(NASA-Case-ARC-10197-1; US-Patent-3,795,840; US-Patent-Appl-SN-310624; US-Patent-Class-317-16; US-Patent-Class-317-31) Avail: US Patent Office CSCL 09A

Electrical equipment to be protected from overvoltage is connected with a possible source of overvoltage via an input conductor. A fuse is connected in series with the input conductor. A spark gap is connected between the input conductor and ground for conducting the overvoltage current to ground and for blowing the fuse to open the circuit to the electrical equipment. A pulse attenuator network is provided between the spark gap and the electrical equipment to be protected for attenuating the pulse of energy passing through the fuse and spark gap prior to blowing of the fuse. The pulse attenuator network includes additional shunt spark gaps, series inductance, and a series connection of a twisted shielded pair of conductors having low-voltage insulation. Official Gazette of the U.S. Patent Office

N74-17930* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEMODULATOR FOR CARRIER TRANSDUCERS Patent
Robert F. Roller, inventor (to NASA) (Westinghouse Elec. Corp., Pittsburgh) Issued 5 Mar. 1974 7 p Filed 24 Nov. 1971 Supersedes N72-21254 (10 - 12, p 1587) Sponsored by NASA
(NASA-Case-NUC-10107-1; US-Patent-3,795,862;

US-Patent-Appl-SN-201700; US-Patent-Class-324-118; US-Patent-Class-324-102; US-Patent-Class-329-50) Avail: US Patent Office CSCL 09E

A carrier type transducer is supplied with a carrier wave via an audio amplifier, a filter, a frequency divider, and an oscillator. The carrier is modulated in accordance with the parameter being measured by the transducer and is fed to the input of a digital data system which may include a voltmeter. The output of the oscillator and the output of each stage of the divider are fed to an AND or a NAND gate and suitable variable and fixed delay circuits to the command input of the digital data system. With this arrangement, the digital data system is commanded to sample at the proper time so that the average voltage of the modulated carrier is measured. It may be utilized with ancillary circuitry for control of the parameter

Official Gazette of the U.S. Patent Office

N74-17931*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

DESIGN, FABRICATION, TEST AND DELIVERY OF A K-BAND ANTENNA BREADBOARD MODEL Final Report

Jan. 1974 163 p refs

(Contract NAS9-13162)

(NASA-CR-134193; MDC-G5058) Avail: NTIS HC $11.25 CSCL 17B

The results of a research effort to develop a Ku-Band single channel monopulse antenna with significant improvements in efficiency and bandwidth are reported. A single aperture, multimode horn, utilized in a near field Cassegrainian configuration, was the technique selected for achieving the desired efficiency and bandwidth performance. In order to provide wide polarization flexibility, a wire grid, space filter polarizer was developed. A solid state switching network with appropriate driving electronics provides the receive channel sum and difference signal interface with an existing Apollo type tracking electronics subsystem. A full scale breadboard model of the antenna was fabricated and tested. Performance of the model was well within the requirements and goals of the contract. Author

N74-17932*# Collins Radio Co., Dallas, Tex.

BROADBAND POWER AMPLIFIER TUBE: KLYSTRON TUBE 5K70SK-WBT AND STEP TUNER VA-1470S Final Report

H. R. Cox and James O. Johnson Jan. 1974 218 p

(Contract NAS5-20375)

(NASA-CR-132934) Avail: NTIS HC $14.00 CSCL 09A

The design concept, the fabrication, and the acceptance testing of a wide band Klystron tube and remotely controlled step tuner for channel selection are discussed. The equipment was developed for the modification of an existing 20 KW Power Amplifier System which was provided to the contractor as GFE. The replacement Klystron covers a total frequency range of 2025 to 2120 MHz and is tuneable to six (6) each channel with a band width of 22 MHz or greater per channel. A 5 MHz overlap is provided between channels. Channels are selected at the control panel located in the front of the Klystron magnet or from one of three remote control stations connected in parallel with the step tuner. Included in this final report are the results of acceptance tests conducted at the vendor's plant and of the integrated system tests. Author

N74-17933# Sandia Labs., Albuquerque, N.Mex.

RADIATION EFFECTS ON MICROELECTRONICS

B. L. Gregory 1973 10 p refs Presented at The Internatl. Soc. for Hybrid Microelectron. Symp., San Francisco, 22 Oct. 1973 Sponsored by AEC

(SLA-73-5731; Conf-731024-1) Avail: NTIS HC $3.00

The major effects of a nuclear radiation environment on microelectronics are reviewed, with emphais on semiconductor devices and other radiation sensitive components. The neutron, ionization dose, and transient radiation effects have been explored for a variety of typical devices. The radiation failure modes are identified for most classes of semiconductor circuit elements, and hardening techniques are reviewed. Estimates are made of current and ultimate hardness levels of semiconductor devices.

Author (NSA)

N74-17934# Commissariat a l'Energie Atomique, Le Barp (France). Centre d'Etude Sci. et Tech. d'Aquitaine.

RECENT DEVELOPMENTS AND APPLICATIONS OF CHRONOMETRIC METHODS AND TECHNIQUES

J.-P. Barrot and Jacques Negrou Sep. 1973 23 p refs In FRENCH

(CEA-R-4467) Avail: AEC Depository Libraries HC $3.25

Principles and specifications are given for: digital memory multichronometers, analyzing equipment working over short time intervals, high-frequency signal/digital analyzers, time interval generator. NSA

N74-17935# Commissariat a l'Energie Atomique, Le Barp (France). Centre d'Etudes Scientifiques et Techniques d'Aquitaine.

ANALYSIS OF FAST HIGH ENERGY ELECTRICAL SIGNALS

J.-P. Barrot and Christian Jaussein Oct. 1973 25 p refs In FRENCH

(CEA-R-4468) Avail: AEC Depository Libraries HC $3.25

An analysis of fast high energy electric signals noting current tension, coaxial structure, characteristics impedance, and perturbation is presented. Transl. by E.H.W.

N74-17936# Academy of Sciences (USSR), Moscow. Inst. for Physical Problems.

SOME PROPERTIES OF PHYSICAL SYSTEMS DESCRIBED BY NONLINEAR FINITE DIFFERENCE EQUATIONS

V. N. Melekhin Toulouse CNRS 1973 3 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS

Avail: NTIS HC $4.00

The common properties of phase motion in the microtron, beam oscillations in open resonators, and other problems confined to nonlinear point mapping are discussed. The use of these physical systems as physical models for experimental investigations of some properties of nonlinear point mapping solutions is highlighted. Electron beam splitting in the microtron and electromagnetic field splitting in open resonators are explained in terms of the island structure of the phase plane when frequency is close to resonant frequencies. ESRO

N74-17937# Centre National de la Recherche Scientifique, Toulouse (France).

METHOD OF CHARACTERIZATION, CONCEPTION, AND SIMULATION OF POWER TRANSISTORS Final Report [METHODES DE CARACTERISATION, DE CONCEPTION ET DE SIMULATION DES TRANSISTORS DE PUISSANCE COMPTE-RENDU DE FIN DE CONTRAT]

P. Leturcq (Inst. Natl. des Sci. Appl.) 15 Nov. 1973 177 p refs In FRENCH

(Contract DGRST-72-7-0521)

(LAAS-Publ-1068) Avail: NTIS HC $12.00

An electric and thermal computerized simulation model for power transistors is presented. The electric model is detailed with regard to collector current and base current densities, coupling equations, parasitic phenomena, and parameters of relevance for the model. The thermal model takes into account temperature distribution at the junctions, and power dissipation at the junction level and isotherm cooler. The two models are coupled interactively during the computer elaboration of the overall model. Detailed calculations pertaining to electric or thermal sub models are given separately in the appendices. ESRO

N74-17938# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.

HIGH FREQUENCIES PROPERTIES OF THE MOS TRANSISTOR

H. Martinot and P. Rossel 1973 31 p refs Presented at the 3d European Solid State Device Res. Conf., Munich, 18-21 Sep. 1973

(LAAS-Publ-1056) Avail: NTIS HC $4.75

A high frequency model of the MOS transistor is proposed, accounting for the substrate effect, the carrier mobility variations with the electric field, and the stray elements due to the structure of the components. The dynamic properties of the channel active zone were studied, from which the matrix of the intrinsic parameters y sub ij were deduced. All the parasitic elements

were identified to elaborate the corresponding quadripole. An equivalent circuit is proposed, and methods to measure the parameters are indicated. The unilateral power gain properties, chosen as the component merit factor, were investigated, and an optimization method for this parameter is proposed. ESRO

N74-17939# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
SWITCHING PHENOMENA AND MEMORY EFFECTS IN N-TYPE METAL SILICON SCHOTTKY DIODES
C. Flassayer, J. L. Morenza Gil, A. Martinez, and D. Esteve 1973 14 p refs Presented at the 3d European Solid State Device Res. Conf., Munich, 18-21 Sep. 1973
(LAAS-Publ-1057) Avail: NTIS HC $4.00

Multistate memory phenomena observed at silicon Schottky contacts are described. An experimental structure was developed consisting of a Schottky contact with a deep P diffused guard ring, that allows operating near the theoretical breakdown voltage. Several samples showed very noisy reverse electrical characteristics and exhibited multistep negative resistance and hysterisis phenomena. Bistable Schottky diodes were developed by diffusing metallic impurities in silicon, which leads to the formation of a metal silicon alloy interlayer. The switching and the memory behavior of these diodes was investigated. ESRO

N74-17940# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
PARAMETER ESTIMATION FOR AN ADAPTIVE INSTRUMENTATION OF HALL'S OPTIMUM, DIGITAL, IMPULSE NOISE RECEIVER Report for Apr. - Jun. 1973
L. M. Nirenberg 24 Aug. 1973 28 p refs
(Contract F04701-73-C-0074)
(AD-771492; TR-0074(4901-02)-3; SAMSO-TR-73-365) Avail: NTIS CSCL 09/4

Newton's method for root-finding is shown to be an effective algorithm for computing maximum likelihood estimates of the bias parameter in Hall's optimum, digital, impulse noise receiver. Use of a bias estimator allows the receiver to be adaptively instrumented. A simulation indicates that the number of independent samples of the impulse noise as modeled by Hall, should be around 20,000 for satisfactory parameter estimates. Author (GRA)

N74-17941# Army Electronics Command, Fort Monmouth, N.J.
THE 27TH ANNUAL FREQUENCY CONTROL SYMPOSIUM
Hans K. Ziegler and Hugh F. Foster, Jr. 1973 458 p refs Symp. held at Cherry Hill, N. J., 12-14 Jun. 1973
(AD-771042) Avail: NTIS CSCL 09/3

Sessions were held on resonator theory; resonator design and measurement; surface phenomena; radiation effects in quartz crystals; frequency generation; crystal filters; frequency and time; realization of the second; lasers and rubidium gas cells; and superconductive resonators and frequency stability measurements. GRA

N74-17942# Army Foreign Science and Technology Center, Charlottesville, Va.
METHOD OF MEASUREMENT OF ELECTRICAL CONTACT RESISTANCES ON A SEMICONDUCTOR-SOLDER BOUNDARY IN THERMOELECTRIC BATTERIES
G. I. Ostrovskii 5 Dec. 1973 7 p refs Transl. into ENGLISH from Khodil. Tekhn. (Moscow), no. 10, 1970 p 56-59
(AD-771782; FSTC-HT-23-2119-72) Avail: NTIS CSCL 09/1

Contact resistances were determined from pressed plates whose resistance is compared with a bulk sample made with the same material and of identical dimensions. The method was applied to Bi-Sb, and Bi-Ti-Sn-Ag solders at 270-380K. The method is faster and more accurate than the probe method. GRA

N74-17943# American Electronic Labs., Inc., Colmar, Pa.
THIN-FILM, LUMPED-ELEMENT CIRCULATOR Final Report, 1 Jul. - 31 Dec. 1973
Donald L. Talhelm 31 Dec. 1973 33 p refs
(Contract N00014-73-C-0495)
(AD-772111) Avail: NTIS CSCL 09/1

The development of a miniature broadband UHF circulator was investigated. The basic design was evolved from Konishi's work on lumped-element circulators. Thin-film techniques were used to implement the resulting circuit design. The methods of Knerr involving a common capacitance to achieve broadband performance were implemented. The effects of ferrite saturation magnetization, ferrite thickness, crossover capacitance, common capacitance, and applied magnetic field were studied. A circulator was produced in a 3/4 inch cube format with less than 1 db insertion loss, 10 db isolation over 200 MHz, centered at 860 MHz. Author (GRA)

N74-17944# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WAVE DUCT ANTENNA WITH MODULATED PHASE VELOCITY AND MULTIPLE USE OF THE ARRAY
O. N. Tereshin, L. N. Kuznetsov, and M. L. Losev 28 Nov. 1973 14 p refs Transl. into ENGLISH from Radiotekh. (USSR), v. 27, no. 1, 1972 p 31-35
(AD-772012; FTD-HT-23-437-74) Avail: NTIS CSCL 09/5

Experimental and theoretical investigations indicated the possibility of the construction of wave duct antennas with a modulated phase velocity and four fold use of the array. The use of such antennas makes it possible to significantly reduce the length of the antenna in comparison with conventional antennas of the wave duct type. GRA

N74-17945# Radio Corp. of America, Princeton, N.J.
ALUMINUM OXIDE PASSIVATION OF ELECTRON-BEAM SEMICONDUCTOR SILICON DIODES Interim Technical Report
W. W. Siekanowicz, H. C. Huang, and R. W. Paglione 1 Nov. 1973 40 p refs
(Contracts N00014-73-C-0020; N00014-73-C-0111; NR Proj. 251-008)
(AD-772101) Avail: NTIS CSCL 09/5

DC and rf measurements have shown that beam-evaporated aluminum oxide constitutes a highly promising material for passivation of electron-beam-semiconductor targets. Aluminum-oxide-passivated targets are characterized by reverse breakdown voltages that range from 80% to essentially the full breakdown value and reverse leakage currents that are less than one microampere. A life of 2600 hours was demonstrated on an aluminum-oxide-passivated target at a current gain of 2200, a beam voltage of 12 kilovolts, power and current densities of 41.5 watts and 0.82 amperes per sq. mm, respectively, on a 0.012-inch active diameter. Author (GRA)

N74-17946# Aerospace Corp., El Segundo, Calif. Lab. Operations.
JOSEPHSON JUNCTION MIXER USING AN EXTERNAL LOCAL OSCILLATOR Technical Report, Jan. - Jun. 1973
Helmut Kanter 21 Nov. 1973 39 p refs
(Contract F04701-73-C-0074)
(AD-771473; TR-0074(9230-02)-4; SAMSO-TR-73-C-0074) Avail: NTIS CSCL 09/5

Mixing experiments on niobium point contacts are reported for conversion from 95 GHz to 140 MHz. The conversion efficiency is less than predicted by the highly damped weak link model. The discrepancy is presumably due to mixing with higher harmonics of the local oscillator. The lowest noise temperature measured was T approximately equal to 100K which is of the same order as recently reported for cooled Schottky-barrier diodes. Author (GRA)

N74-17947# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
BROADBAND TRANSMITTER TUBE Triannual report no. 3, Mar. - Sep. 1973
A. E. Manoly Nov. 1973 25 p
(Contract DAAB07-77-C-0294; DA Proj. 1S0-62102-A-042) (AD-771996; EDD-W-5262-3; ECOM-0294-3) Avail: NTIS CSCL 09/1

Construction of two experimental tubes was completed. The tubes were built with separate input and output solenoid sections which allows for fine adjustments in the focusing. The tubes were packaged similar to existing production tubes. The third tube is in final stages of construction. Tests and evaluations

were completed on two tubes and data are presented. Cold tests were conducted to determine the effect of attenuated boron nitride support rods on the center phase-locking strap. An outline of the final packaged tube is shown. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-17948*# Martin Marietta Aerospace, Denver, Colo.
EVALUATION OF WET TANTALUM CAPACITORS AFTER EXPOSURE TO EXTENDED PERIODS OF RIPPLE CURRENT, VOLUME 1
G. W. Watson, J. C. LaSharr, and M. J. Shumaker Washington NASA Mar. 1974 38 p refs
(Contract NAS1-9000)
(NASA-CR-2411; TN-3770201-Vol-1) Avail: NTIS HC $3.25 CSCL 09C

The application of tantalum capacitors in the Viking Lander includes both dc voltage and ripple current electrical stress, high temperature during nonoperating times (sterilization), and high vibration and shock loads. The capacitors must survive these severe environments without any degradation if reliable performance is to be achieved. A test program was established to evaluate both wet-slug tantalum and wet-foil capacitors under conditions accurately duplicating actual Viking applications. Test results of the electrical performance characteristics during extended periods of ripple current, the characteristics of the internal silver migration as a function for extended periods of ripple current, and the existence of any memory characteristics are presented. Author

N74-17949*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MOTOR RUN-UP SYSTEM Patent Application
John J. Daeges, inventor (to NASA) (JPL) Filed 7 Mar. 1974 22 p
(Contract NAS7-100)
(NASA-Case-NPO-13374-1; US-Patent-Appl-SN-449118) Avail: NTIS HC $4.25 CSCL 09C

A starting system for bringing a large synchronous motor up to speed to prevent large power line disturbances at the moment the motor is connected to the power line is introduced. The system includes a digital counter which generates a count determined by the difference in frequency between the power line and a small current generated by the synchronous motor, a latch which stores the count, and a comparator which compares the stored count with a newly generated count to determine whether the synchronous motor is accelerating or decelerating. Signals generated by the counter and comparator control current to a clutch that couples a starting motor to the large synchronous motor. NASA

N74-17950# Sandia Labs., Albuquerque, N.Mex.
STUDIES OF Cr-Au THIN FILMS USED IN HYBRID MICROCIRCUITS
B. T. Kenna, ed Sep. 1973 33 p
(Contract AT(29-1)-789)
(SLA-73-793) Avail: NTIS HC $3.75

The capabilities of analytical techniques applied to the Cr-Au problem are described in terms of their applicability to the characterization of these and other films. The results and conclusions associated with this hybrid microcircuitry (HMC) system are then described. Author

N74-17951# Sandia Labs., Albuquerque, N.Mex.
PRELIMINARY PHOTOLITHOGRAPHIC PROCEDURES FOR HYBRID SUBSTRATES WITH CONDUCTIVE VIAS
R. E. Hampy and R. E. Wright Sep. 1973 27 p refs
(Contract AT(29-1)-789)
(SLA-73-805) Avail: NTIS HC $3.50

A description is given of several photolithographic procedures which were developed to provide conductive feed-throughs or "vias" in hybrid microcircuits on alumina substrates in order to provide an electrical connection(s) between the front and back metallized conductor layers. Author

N74-17952# Sandia Labs., Albuquerque, N.Mex.
DEVELOPMENT OF PRODUCTION DEFINITION AND ASSOCIATED PROBLEMS OF THE MC2305 HYBRID CIRCUITS, JUNE 1969 - DECEMBER 1971
D. W. Bushmire Sep. 1973 25 p refs
(Contract AT(29-1)-789)
(SLA-73-806) Avail: NTIS HC $3.25

Sandia procurement experience with the MC2305 thin film hybrid microcircuits is described. The MC2305 radar is a part of the MK3 arming, firing, and fusing system. These circuits use tantalum nitride as resistor material and aluminum as conductor material. The applique parts are chip-on-channel semiconductor devices and barium-titanate capacitors held down with epoxy. The interconnect system includes three-mil and one-mil aluminum wires with ultrasonic bonding. The discrete devices (capacitors, transistors and diodes) were procured from outside vendors by Collins Radio and assembled on the thin film substrate at Collins Radio. Specifications for the discrete devices and the completed hybrid circuit were originated at Sandia Laboratories. Author (NSA)

N74-17953# Danish Atomic Energy Commission, Risoe.
ELECTRONICS DEPARTMENT Annual Report, 1972
Aug. 1973 37 p refs
(RISO-M-1632) Avail: AEC Depository Libraries HC $4.00

Topics briefly discussed include: determination of uranium and thorium by means of neutron activation analysis, aeroradiometric survey techniques, analysis of control tasks in a power plant unit, alarm presentation, methods for description of complex systems reliability, hybrid computer, research instrumentation, and laser technology. Lectures and publications are listed. NSA

N74-17954# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
SYNTHESIS AND SENSITIVITY CALCULATION OF ACTIVE FILTERS USING RC ELEMENTS AND OPERATIONAL AMPLIFIERS [SYNTHESE ET CALCUL DE SENSIBILITES DE FILTRES ACTIFS A AMPLIFICATEURS OPERATIONNELS ET ELEMENTS R.C. AVEC CONTRAINTES DE REALISATION]
C. Gimenes May 1972 49 p refs In FRENCH
(Rept-1.732) Avail: NTIS HC $5.50

A synthesis program was developed for calculating active filters with given attenuation characteristics. It can be applied to filters with polynomial transfer functions (Bessel, Butterworth, Papoulis, Chebycheff), or with infinite attenuation points (Cauer). The adopted structures are structures with controlled source or with multiple counter-reaction, but the program can be adapted to other structures. The synthesis technique adopted splits the transfer function into simple functions. A module, allowing the analysis of attenuation, phase, and transit time, follows the synthesis to verify the results. A sensitivity calculation module - sensitivity of poles and zeros of the transfer function, sensitivity of the gain and the phase-provides a great deal of information about the structure adopted. ESRO

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-17955* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL MODEL AND METHOD Patent
Charlie M. Jackson, Jr. and Dallas G. Summerfield, inventors (to NASA) Issued 12 Feb. 1974 4 p Filed 19 Jun. 1972 Supersedes N72-27272 (10 - 18, p 2407)
(NASA-Case-LAR-10812-1; US-Patent-3,791,207;

US-Patent-Appl-SN-263815; US-Patent-Class-73-147) Avail: US Patent Office CSCL 14B

The design and development of a wind tunnel model equipped with pressure measuring devices are discussed. The pressure measuring orifices are integrally constructed in the wind tunnel model and do not contribute to distortions of the aerodynamic surface. The construction of a typical model is described and a drawing of the device is included. P.N.F.

N74-17956*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

PRINCIPLES AND APPLICATION OF SHOCK-TUBES AND SHOCK TUNNELS

Robert C. Ried and Harry G. Clauss, Jr. 22 Oct. 1963 47 p refs

(NASA-TM-X-69941; Working-Paper-10014) Avail: NTIS HC $5.50 CSCL 14B

The principles, theoretical flow equations, calculation techniques, limitations and practical performance characteristics of basic and high performance shock tubes and shock tunnels are presented. Selected operating curves are included. Author

N74-17957*# Rensselaer Polytechnic Inst., Troy, N.Y. School of Engineering.

DYNAMIC EVALUATION OF RPI'S 0.4 SCALE UNMANNED MARTIAN ROVING VEHICLE MODEL M.S. Thesis

Alan G. Ryder Dec. 1973 57 p refs

(Grant NGL-33-018-091)

(NASA-CR-137077; RPI-TR-MP-38) Avail: NTIS HC $6.00 CSCL 13F

A design for a Mars Roving Vehicle is presented in a three dimensional model considering three degrees of freedom. In addition, the physical characteristics of the 0.4 scale RPI-MRV are presented along with the basic dynamic responses. Author

N74-17958*# Scientific Translation Service, Santa Barbara, Calif.

CONCERNING THE PERFORMANCE DATA OF A REVERBERATION CHAMBER

K. Niwa, S. Aramaki, and Y. Nagasawa Washington · NASA Mar. 1974 11 p ref Transl. into ENGLISH from Koku Igaku Jikkentai Hokoku (Tokyo), v. 8, no. 1-2, Sep. 1967 p 54-59

(Contract NASw-2483)

(NASA-TT-F-15371) Avail: NTIS HC $4.00 CSCL 14B

The characteristics of a reverberation chamber designed for investigating the physiological effects of aircraft noise are discussed. An OS-620 type noise field generator was used as the sound source. The equipment for measuring the reverberation time is described. The sound pressure distribution inside the chamber was measured by drawing lines in radial form from the center of the room to the corners and the centers of the walls. Measurements were taken at one meter intervals along the lines. Author

N74-17959*# Hydronautics, Inc., Laurel, Md.

MODEL EXPERIMENTS TO EVALUATE VORTEX DISSIPATION DEVICES PROPOSED FOR INSTALLATION ON OR NEAR AIRCRAFT RUNWAYS

Robert E. Kohl Aug. 1973 116 p refs

(Contract NAS1-11389)

(NASA-CR-132365) Avail: NTIS HC $9.00 CSCL 13B

The effectiveness of various vortex dissipation devices proposed for installation on or near aircraft runways is evaluated on basis of results of experiments conducted with a 0.03-scale model of a Boeing 747 transport aircraft in conjunction with a simulated runway. The test variables included type of vortex dissipation device, mode of operation of the powered devices, and altitude, lift coefficient and speed of the generating aircraft. A total of fifteen devices was investigated. The evaluation is based on time sequence photographs taken in the vertical and horizontal planes during each run. Author

N74-17960*# Boeing Commercial Airplane Co., Seattle, Wash.

DESIGN AND FABRICATION OF AN AUGMENTOR WING MODEL FOR ACOUSTIC TESTS

John Jackson, R. W. Schedin, and J. M. Campbell Dec. 1973 102 p ref

(Contract NAS3-17362)

(NASA-CR-134518; D6-41465) Avail: NTIS HC $8.25 CSCL 14B

The design and fabrication of a full-scale section of an augmentor wing to be used for acoustic testing at the Lewis Research Center are discussed. This hardware will be used primarily to investigate scaling effects of acoustic data obtained during the Boeing-run model tests. Typical model test data is shown in the report, together with predictions on both performance and acoustics that can be expected from the full-scale section to be built. Areas covered include: the aerodynamic and acoustic criteria of the flap system and nozzles, detailed discussion of the hardware, test system operation procedure, and stress analysis of the entire test system. Author

N74-17961# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Physikalische Chemie.

ACCLIMATIZED WIND TRACK FOR MEASUREMENT OF OXYGEN ISOTOPE FRACTIONATION IN ISOLATED LEAVES AND IN LEAF MODELS

W. Hotopp and H. Foerstel May 1973 45 p refs In GERMAN; ENGLISH summary

(JUL-949-PC) Avail: AEC Depository Libraries HC $4.25

The planning and layout of a small wind track in which fixed climatic conditions can be adjusted are presented. The facility was designed for model investigations concerning the oxygen isotope fractionation of fluid water exchanging with the water vapor of streaming air. Further measurements are planned to investigate the O-18 isotope enrichment within the leaf water of land plants. The wind track was built as a closed system. Wind velocities can be controlled between 0.5 and 3.5 m/sec within a temperature range of 5 to 35 C and the humidity can be controlled between 20 and 90%. With these data it is possible to simulate normal environmental conditions for land plants.

Author (NSA)

N74-17962*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

THE NINETH INTERNATIONAL SHOCK TUBE SYMPOSIUM Final Technical Report

Daniel Bershader and Wayland C. Griffith 5 Nov. 1973 28 p Symp. held at Stanford Univ., Standford, Calif., 16-19 Jul. 1973 Sponsored in part by NASA

(Grant AF-AFOSR-2415-72)

(NASA-CR-137066; AD-771017; AFOSR-73-2138TR) Avail: NTIS HC $4.50 CSCL 14/2

The symposium attracted around 230 registrants from some 18 countries. A series of 10 technical sessions provided for the presentation of two principal invited lectures, seven additional invited lectures, and 67 contributed papers, selected from a considerably larger number of submissions. Special features of the meeting were the four brainstorming conferences and the visit to the NASA-Ames Research Center. The complete proceedings, edited by the authors of this report under the title Recent Developments in Shock Tube Research, have been published by the Stanford University Press as an 830-page book. (Modified author abstract) GRA

N74-17963# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

DEVELOPMENT OF MINIMUM PIPE-COVER REQUIREMENTS FOR C-5A AND OTHER AIRCRAFT LOADINGS Final Report, Jun. 1970 - Jun. 1972

Charles C. Calhoun, Jr. and Harry H. Ulery, Jr. Nov. 1973 131 p refs

(DA Proj. 4A0-62203-A-859)

(AD-771174; AEWES-Misc-Paper-S-73-65) Avail: NTIS CSCL 01/5

The investigation was conducted to develop structural requirements (minimum cover tables) for buried pipe beneath flexible- and rigid-pavement, landing-mat-surfaced, and unsurfaced airfields subject to operations of the C-5A and other aircraft in the theater of operations. Present design practices were reviewed, and computer programs based on the present design practices were written and used to predict pipe behavior under various loadings. Stress-at-depth data from full-scale load cart tests, field surveys, and tests of pipe subjected to the C-5A and other loadings were analyzed, and the field behavior was compared with predicted behavior. Minimum pipe-cover requirements were

developed for rigid and flexible pipe buried beneath airfields to be subjected to operations of the C-5A and other aircraft. (Modified author abstract) GRA

N74-17964# Army Foreign Science and Technology Center, Charlottesville, Va.
DE-7 RUNWAY MAINTENANCE VEHICLE
M. Krivoshein 27 Jul. 1973 7 p Transl. into ENGLISH from Stroit. Forozhnye Mashiny (USSR), no. 4, 1972 p 18-20
(AD-771419; FSTC-HT-23-963-73) Avail: NTIS CSCL 13/6

The report discusses the design, operation and capabilities of the DE-7 runway maintenance vehicle. The vehicle is largely based on series-production components, cleans the surface with a blade, sweeper and cold air blower, and is generally more productive than other models. Operator convenience was given consideration in this design. Author (GRA)

N74-17965# Ford Motor Co., Dearborn, Mich. Transportation Research and Planning Office.
PRELIMINARY DESIGN STUDIES OF MAGNETIC SUSPENSIONS FOR HIGH SPEED GROUND TRANSPORTATION. VOLUME 2: EXPERIMENTAL RIDE SIMULATION STUDIES Final Report, Jun. 1972 - Jun. 1973
Robert H. Borcherts, Dennis F. Wilkie, L. C. Davis, and John R. Reitz Jun. 1973 31 p refs
(Contract DOT-FR-10026)
(PB-224893/8GA; FRA-RT-73-27A-Vol-2) Avail: NTIS HC $3.75 CSCL 13F

The report describes an experimental program using human subjects to evaluate the ride quality resulting from specific suspension strategies, and to compare these with a standard ride. The study is part of a more general task to learn how to isolate guideway irregularities from high speed ground vehicles to insure passenger comfort. The results of the study show the following: A ride evaluation by different individuals is a meaningful approach; the discomfort index criterion is roughly correct but has some limitations; the standard ride which was used for comparison, namely, the DOT ride quality specification, is not a particularly good ride; and magnetic suspensions operating on a moderately smooth guideway at 483 Km/hr will require active control in order to produce ride quality approaching that of a jet aircraft on a quiet day. GRA

N74-17966# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.
A FEASIBILITY STUDY OF IMPACT SURFACE PRESSURE GAUGING WITH DYE-FILLED MICROCAPSULES Final Report, Jun. 1972 - Sep. 1973
W. J. Astelford, G. R. Somerville, C. F. Schuetze, and R. H. Hemion Nov. 1973 90 p refs
(Contract DOT-HS-024-2-490)
(PB-225577/6GA; SWRI-AR-910; DOT-HS-800965) Avail: NTIS HC $3.75 CSCL 13F

The feasibility of using a composite sheet material comprised of dye-filled microcapsules adhered to a flexible substrate as a contact surface load or pressure sensor in vehicle occupant impact testing was investigated. The theory of filled capsule failure under axisymmetric loading was explored and optimum formulations of capsule shell/fillers developed. A unique load calibration technique was developed utilizing photometric analysis of impact test samples. The high potential of this investigative tool to supplement other measurements in impact testing was demonstrated. GRA

N74-17967# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
FIRE ENVIRONMENTAL TEST CHAMBER: IT'S DESIGN AND DEVELOPMENT Final Forest Service Research Note
Clifford J. Auvil 1973 10 p
(PB-225402/7GA; FSRN-PSW-280) Avail: NTIS HC $3.00 CSCL 02F

The Fire Environmental Test Chamber at the Forest Fire Laboratory, Riverside, California, can duplicate under controlled conditions the key factors that affect the flammability of wildland fuels. Within certain limits, it can produce air flow, solar radiation, temperatures, and relative humidity. First developed in 1962, the test chamber has since then undergone several modifications to meet requirements over and above the original capabilities. The characteristics of the test chamber and nature of the changes are explained. Recommendations on design and development are offered. Author (GRA)

N74-18621 Joint Publications Research Service, Arlington, Va.
STATE OF SCIENTIFIC RESEARCH EVALUATED
S. Dautbegovic *In its* Transl. on Eastern Europe: Sci. Affairs, No. 386 (JPRS-61213) 13 Feb. 1974 p 18-20 Transl. into ENGLISH from Oslobodjenje (Sarajevo), 30 Jan. 1974 5 p (For availability see N74-18619 09-34)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-17968 Engineering Sciences Data Unit, London (England).
[THRUST MEASUREMENT DURING FLIGHT]
[1973] 3 p refs
(ESDU-69007-Amend-A) Copyright. Avail: Issuing Activity

Changes in the methods of measuring thrust flight are reported in an addenum. Data cover isentropic flow equations, jet pipe measurements, and gas generator methods. E.H.W.

N74-17969 Engineering Sciences Data Unit, London (England).
ONE-DIMENSIONAL ISENTROPIC GAS FLOW
1970 11 p Sponsored by Roy. Aeron. Soc.
(S.00.03.07) Copyright. Avail: Issuing Activity

The one-dimensional steady isentropic flow of a perfect gas in a vacuum wind tunnel is examined. Two problems using air and helium were solved and the results are given in graphs. E.H.W.

N74-17970*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL STUDIES OF HYPERSONIC BOUNDARY-LAYER TRANSITION AND EFFECTS OF WIND TUNNEL DISTURBANCES
P. Calvin Stainback, Richard D. Wagner, F. Kevin Owen, and Clifford C. Horstman Mar. 1974 48 p refs
(NASA-TN-D-7453; L-9154) Avail: NTIS HC $3.25 CSCL 20D

Boundary layer transition data on cones and free stream disturbance levels were measured in a hypersonic wind tunnel and Mach 8 variable density hypersonic tunnel. Transition data were obtained by using different conical models and techniques for detecting the location of transition. The disturbance levels were measured by using hot wire anemometry and pressure transducers. The transition Reynolds numbers obtained from the tests correlated well when the fluctuating pressures measured at the surface of conical models were used as a correlating parameter. Author

N74-17971*# Scientific Translation Service, Santa Barbara, Calif.
HEAT TRANSFER BETWEEN LAMINAR LIQUID JET AND A FLAT SURFACE
M. Wolfshtein Washington NASA Mar. 1974 47 p refs Transl. into ENGLISH of Technion - Israel Inst. of Tech., Haifa, M.S. Thesis, 1964 45 p
(Contract NASw-2483)
(NASA-TT-F-15373) Avail: NTIS HC $5.50 CSCL 20D

A description is given of the results of research on heat transfer and flow phenomena in a liquid jet impinging on a flat perpendicular surface. The various zones of flow inside the impinging jet are examined, and the general character of the flow in each of them is established. Author

N74-17972*# Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL INVESTIGATION OF LOCAL HEAT TRANSFER FROM A PLATE IN THE REGION OF LAMINAR TO TURBULENT BOUNDARY LAYER TRANSITION

V. M. Legkiy, A. S. Makarov, and Yu. D. Koval Washington NASA Mar. 1974 9 p refs Transl. into ENGLISH from Teplofiz. i Teplotekhnika, no. 23, 1973 p 106-109
(Contract NASw-2481)
(NASA-TT-F-15418) Avail: NTIS HC $4.00 CSCL 20D

An experimental investigation was conducted of local heat transfer from a plate in the region of laminar to turbulent boundary layer transition. In wind tunnel tests, a plate underwent certain experiments; in the first, the flow was determined by the quantity of flow unit and degree of turbulence. In the second, the turbulence level flow was increased artificially before it struck the plate. Measurements were made and conclusions were drawn. Author

N74-17973# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
PROGRESS IN THE DEVELOPMENT OF A REYNOLDS STRESS TURBULENCE CLOSURE
B. E. Launder, G. J. Reece, and W. Rodi Dec. 1973 56 p refs Sponsored by Sci. Res. Council and Central Elec. Generating Board
(HTS/73/31) Avail: NTIS HC $6.00

Proposals are presented for a model of turbulence in which the Reynolds stresses are determined from the solution of transport equations for these variables and for the turbulence energy dissipation rate. Particular attention has been given to the approximation of the pressure-strain correlations. The forms adapted appear to give reasonably satisfactory partitioning of the stresses both near walls and in free shear flows. Numerical solutions of the model equations are presented for a selection of strained homogeneous shear flows and for two dimensional inhomogeneous shear flows including the jet, the wake, the mixing layer and plane channel flow. In addition, it is shown that the closure does predict the very strong influence of secondary strain terms for flow over curved surfaces. Author

N74-17974# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
LAMINAR AND TURBULENT FORCED CONVECTION PROCESSES THROUGH IN-LINE TUBE BANKS
R. F. LeFeuvre Sep. 1973 246 p refs
(HTS/74/5) Avail: NTIS HC $15.50

The basis of a general numerical procedure for predicting steady, two-dimensional, incompressible, laminar or turbulent flows in nonrectangular domains is described. The novelties of the procedure include the use of a rectangular grid arrangement for non-rectangular domains (RAND grid), and a new - upwind method of approximating the convection terms in the conservation equations. The accuracy and convergence properties of the procedure are tested by the prediction of both flows with analytical solutions and laminar flow over a single cylinder. The usefulness of the procedure is demonstrated by new predictions of laminar flow over in - line tube banks. To permit the prediction of turbulent flows, a version of the Kolmogorov - Prandtl hypothesis of turbulence is employed. Also used is a novel set of wall functions, which specify the variation of the dependent variables next to wall boundaries. The reliability of these models is tested by comparing the predictions of turbulent developing flow through a parallel channel and fully-developed flow through in - line tube banks with appropriate experimental data. Author

N74-17975*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF FLANGES ON PRESSURE DISTRIBUTION ON A FLAT PLATE AND ON A CORRUGATED SURFACE AT MACH NUMBERS FROM 0.60 TO 1.97
Albert L. Johns and Merle L. Jones Washington Mar. 1974 32 p refs
(NASA-TM-X-2968; E-7519) Avail: NTIS HC $3.25 CSCL 20D

An 8 by 6 foot supersonic wind tunnel was used to obtain the static pressure distribution on a plate in the region of a flange placed normal to the airstream. Tests were conducted on both a flat plate surface and a corrugated surface using flange heights ranging from 10 to 125 percent of the boundary layer height. Data were obtained at a zero degree angle-of-attack and at Mach numbers from 0.60 to 1.97. Author

N74-17976*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DRAG AND DISTRIBUTION MEASUREMENTS OF SINGLE-ELEMENT FUEL INJECTORS FOR SUPERSONIC COMBUSTORS
Louis A. Povinelli Washington Mar. 1974 25 p refs
(NASA-TM-X-3015; E-7662) Avail: NTIS HC $3.00 CSCL 01A

The drag caused by several vortex generating fuel injectors for scramjet combustors was measured in a Mach 2 to 3.5 airstream. Injector drag was found to be strongly dependent on injector thickness ratio. The distribution of helium injected into the stream was measured both in the near field and the far field of the injectors for a variety of pressure ratios. The far field results differed appreciably from measurements in the near field. Injection pressure ratio was found to profoundly influence the penetration. One of the aerowing configurations tested yielded low drag consistent with desirable penetration and spreading characteristics. Author

N74-17977*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A GENERAL REVIEW OF CONCEPTS FOR REDUCING SKIN FRICTION, INCLUDING RECOMMENDATIONS FOR FUTURE STUDIES
Michael C. Fischer and Robert L. Ash (Old Dominion Univ.) Washington Mar. 1974 45 p refs
(NASA-TM-X-2894; L-9119) Avail: NTIS HC $3.25 CSCL 20D

Four main concepts which have significantly reduced skin friction in experimental studies are discussed; suction, gaseous injection, particle additives, and compliant wall. It is considered possible that each of these concepts could be developed and applied in viable skin friction reduction systems for aircraft application. Problem areas with each concept are discussed, and recommendations for future studies are made. Author

N74-17978# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON PRESSURE PULSATIONS IN THE BASE REGION WITH GAS INJECTION
V. A. Liutyi [1974] 3 p ref Transl. into ENGLISH from Dopovidi Akad. Nauk Ukr. SSR (Kiev), no. 11, 1973 p 1015-1017
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The change in pressure pulsations acting on a model is studied. Cone cylinder models with a porous base (840 holes, d = 2 mm), through which the gas is injected, were also investigated. The excess gas was measured by a sonic nozzle; pressure pulsations were measured by using a differential miniature inductive transducer. J.A.M.

N74-17979# Lockheed Missiles and Space Co., Palo Alto, Calif.
BOUNDARY LAYER ON A POROUS PLATE. UNIVERSAL FUNCTIONS
V. I. Koifman [1974] 6 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Mat., Mekh. (USSR), no. 6, 1973 p 80-86
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The problem of a boundary layer on a plate with gas injection in the flow domain is examined. The method proposed for the solution permits universal fluctuations to be obtained for the velocity and temperature distributions when the leakage velocity is representable by a Taylor series. Mathematical models are provided to support the theoretical considerations. Author

N74-17980# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
TWO-PHASE FLOW DYNAMICS: PROPAGATION OF SMALL DISTURBANCES
Jean Boure Oct. 1973 30 p refs In FRENCH
(CEA-R-4456) Avail: AEC Depository Libraries HC $3.50

The study of the dynamic behavior of two-phase flows is shown to be closely related to that of propagation phenomena. Consequences of this fact based on mathematical models are discussed. The various kinds of models are compared from this

point of view, according to the number of conservation equations that they include. Some results from the theory of characteristics are recalled, and the propagation of small disturbances are studied, using a general six conservation equation model. The well-known single-phase flow results appear as limiting cases of the two-phase flow results. In two-phase flows, disturbances give rise to mixed waves which are akin to the dynamic waves of single-phase compressible flows as well as to the kinematic or continuity waves of two-phase incompressible flows. The assumptions made are discussed in the light of the results obtained. Author (NSA)

N74-17981# Institut Franco-Allemand de Recherches, St. Louis (France).
CARACATH PROGRAM FOR THE COMPUTATION OF TWO-DIMENSIONAL NOZZLE FLOW USING THE METHOD OF CHARACTERISTICS [CARACATH: PROGRAMME DE CALCUL DE L'ECOULEMENT DANS LA TUYERE PLANE PAR LA METHODE DES CARACTERISTIQUES]
M. Joly 17 May 1973 49 p refs In FRENCH
(Contract DRME-73/096)
(ISL-12/73) Avail: NTIS HC $5.50

The computation of ideal non viscous gas flow in a two-dimensional supersonic nozzle is presented. The transonic flow was computed using an approximate method and the supersonic flow was computed using the method of characteristics. The program written for an IBM 360-40 computer is described and numerical examples, including the evolution of Mach number in the nozzle plane of symmetry, at the nozzle wall, and along a line parallel to the plane of symmetry of the nozzle, are given.
ESRO

N74-17982# Ecole Nationale Superieure de Techniques Avancees, Paris (France).
ASYMPTOTIC AND NUMERICAL APPROACHES OF SONIC FLOWS
D. Euvrard, F. Grosjean (Brest Univ., France), and G. Tournemine (Rennes Univ., France and Brest Univ., France) 1973 60 p refs Presented at the EUROMECH 40 Colloq. Transonic Aerodyn., Saltsjoebaden, Sweden, 10-13 Sep. 1973 Sponsored in part by Direc. des Rech. et Moyens d'Essais
(Rept-025) Avail: NTIS HC $6.00

Sonic flows were analyzed asymptotically and numerically. Some questions were clarified concerning asymptotic behavior at infinity, starting from basic self-similar solutions. Several expansions were established for plane, axisymmetric, and three-dimensional flows past finite or semi-finite bodies, in front and behind the shock waves, for inviscid or viscous fluids. A further step aims at the numerical computation of the transonic range using the asymptotic behavior as a boundary condition. The results so far obtained are in good agreement with experiments and emphasize the usefulness of previous asymptotic studies.
ESRO

N74-17983# Admiralty Research Lab., Teddington (England).
USE OF TWO-DIMENSIONAL UNSTEADY FLOW THEORY WITH LOW ASPECT-RATIO BLADES
M. T. Murray May 1973 15 p refs
(ARL/M/N-17; BR37049; N-1/3.85) Avail: NTIS HC $4.00

It is known that if two-dimensional aerofoil theory is used to calculate the mean forces on a marine propeller blade, the answer obtained is likely to over-estimate the true answer by a factor of typically three. It is shown that when unsteady forces (at shaft-rate or blade-rate) are being caculated, the use of unsteady two-dimensional aerofoil theory is much more acceptable, being associated with errors of about 60% for shaft-rate forces and 25% for blade-rate forces. It is pointed out that the more accurate unsteady lifting-surface theory is prohibitively expensive for use regularly as a design tool, and further, that the accuracy of the answer may be limited in any case by the accuracy of the measured wake data. Author (ESRO)

N74-17984# Admiralty Research Lab., Teddington (England).
PERFORMANCE OF A TWO PHASE FLOW MIXING CHAMBER-NOZZLE COMBINATION
A. J. Brown May 1972 27 p refs
(ARL/G/N-49; BR37559; ARL/N-2/G/HY/11/1) Avail: NTIS HC $4.50

The performance curves of a mixing chamber-nozzle combination are presented and the effects of supplying heated air to the chamber are discussed with aid of curves showing the energy level available from isothermal and adiabatic gas expansions. Higher pressure ratios, than those predicted by a critical flow design formula, were achieved due to large phase slip.
Author (ESRO)

N74-17985# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
BEHAVIOR OF VISCOUS TURBULENT BOUNDARY LAYER WALL FLOW [EINIGE THEORETISCHE BEMERKUNGEN ZUM VERHALTEN DER VISKOSEN WANDSTROEMUNG TURBULENTER GRENZSCHICHTEN]
F. Obermeier Jul. 1973 40 p refs In GERMAN Supersedes Rept-132/1972
(Rept-8/1973; Rept-132/1972) Avail: NTIS HC $5.00; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. 11.10 DM

An approximation method for the theoretical description of a turbulent boundary layer flow near a wall, based on continuity and Navier-Stokes equations, was derived. The difference between theoretical and experimental flow parameters is discussed.
ESRO

N74-17986# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
INVISCID SUPERSONIC NONUNIFORM FLOWS OVER SHARP AND SPHERICALLY BLUNTED CONES AT ANGLE OF ATTACK. VOLUME 2: COMPUTER PROGRAM DESCRIPTIONS AND USER'S GUIDE Final Report, 1 Sep. 1969 - 1 Dec. 1972
Roie R. Black and Clark H. Lewis Aug. 1973 145 p refs
(Contract F33615-70-C-1015; AF Proj. 7064)
(AD-770169; ARL-73-0124-Vol-2) Avail: NTIS

A system of six computer programs which may be arranged into several program packages for the purpose of solving inviscid flow fields over sharp and spherically blunted cones at angle of attack in both uniform and nonuniform supersonic free streams has been developed. These programs are written in standard FORTRAN 4 and are currently being run on the Virginia Polytechnic Inst. and State University IBM 370/155 computer. The six programs include a modified inverse blunt body solution program, a modified axisymmetric method of characteristics program, a modified three-dimensional method of characteristics program, two sharp cone zero and nonzero angle of attack uniform flow solution programs, and a master data input control program which reads input data and passes information to the other programs. (Modified author abstract) GRA

N74-17987# Aerospace Corp., El Segundo, Calif. Space Physics Lab.
LARGE AMPLITUDE CONVECTION IN POROUS MEDIA Report for Apr. - Aug. 1973
Joe M. Straus 15 Dec. 1973 35 p refs
(Contract F04701-73-C-0074)
(AD-771483; TR-0074(4260-10)-6; SAMSO-TR-73-384) Avail: NTIS CSCL 20/4

The properties of convective flow driven by an adverse temperature gradient in a fluid-filled porous medium are investigated. The Galerkin technique is used to treat the steady state two dimensional problem for Rayleigh numbers as large as ten times the critical value. The flow is found to look very much like ordinary Benard convection, but the Nusselt number depends much more strongly on the Rayleigh number than in Benard convection. The stability of the finite amplitude two dimensional solutions is treated. At a given value of the Rayleigh number, stable two dimensional flow is possible for a finite band of horizontal wavenumbers as long as the Rayleigh number is small enough. For Rayleigh numbers larger than about 380, however, no two-dimensional solutions are stable. Comparisons with previous theoretical and experimental work are given.
Author (GRA)

N74-17988# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
AN EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF INTERNAL TRANSONIC FLOW Interim Report, 26 Aug. 1971 - 30 Jun. 1973

Ronald D. Flack and H. Doyle Thompson 29 Oct. 1973 189 p refs
(Contract DAAH01-72-C-0089; DA Proj. 1M2-62303-A-214)
(AD-771047; RD-73-20) Avail: NTIS CSCL 20/4

Internal transonic flow has been investigated both analytically and experimentally. In the analytical investigation a previously developed computer program was used to compute the transonic flow field for diverse two-dimensional and annular nozzle configurations. The analytical investigation included establishing the limits on nozzle geometries for which the method is applicable. Comparisons were made with experimental data, including a limited amount of previous experimental data, and with other analytical solutions. (Modified author abstract) GRA

N74-17989# Center for Naval Analyses, Arlington, Va.
OBSERVATIONS OF THE PERFORMANCE OF TUCUMCARI (PGH-2) IN US COAST GUARD MISSION ORIENTED TRAILS Final Report
T. R. Mitchell, J. P. Donnelly, and J. A. Nevendorffer Mar. 1973 64 p refs
(Contract DOT-CG-21941-A)
(AD-771400; USCG-D-9-73) Avail: NTIS CSCL 13/10

The report presents and discusses the observations and data recorded by Center for Naval Analyses observers during the conduct of trials by the U.S. Coast Guard of the U.S. Navy's TUCUMCARI (PGH-2) hydrofoil craft. The primary objectives of these trials were to demonstrate the capabilities and effectiveness of hydrofoil craft in undertaking selected Coast Guard missions. Author (GRA)

N74-17990# Air Force Academy, Colo. Frank J. Seiler Research Lab.
IMPROVED SOLUTIONS TO THE FALKNER-SKAN BOUNDARY LAYER EQUATION Final Report, Dec. 1971 - Aug. 1973
Carl A. Forbrich, Jr. Nov. 1973 43 p refs
(AF Proj. 7905)
(AD-771613; SRL-TR-73-0016) Avail: NTIS CSCL 20/4

In certain cases, the equation for the velocity profile in the boundary layer can be approximated by U = c(x sup m), and the Prandtl boundary layer equations reduce to the ordinary differential equation F triple prime = -F(F double prime) + beta((F' squared)-1), which is referred to as the Falkner-Skan boundary layer equation. Solutions for F, F', F double prime and F triple prime for values of beta are presented here in the form of seven place tables. In addition delta, theta and H, which are useful in transforming the solutions from non-dimensional to dimensional form, are included so that the tables will be easy to use. The Falkner-Skan equation was solved on the Burroughs B-6700 digital computer using an extremely accurate state variable formulation of the problem. In this approach, the third order ordinary differential equation is reduced to a system of first-order ordinary differential equations which are easily solved. Author (GRA)

N74-17991# Brown Univ., Providence, R.I. Dept. of Engineering.
THE SOLUTION OF VISCOUS INCOMPRESSIBLE JET AND FREE SURFACE FLOWS USING FINITE ELEMENT METHODS
Robert E. Nickell, Roger I. Tanner, and Bruce Caswell Aug. 1973 50 p refs
(Contract N00014-67-A-0191-0025)
(AD-772067; TR-2) Avail: NTIS CSCL 20/4

The authors discuss the creation of a finite element program suitable for solving incompressible, viscous free surface problems in steady axisymmetric or plane flows. For convenience in extending program capability to non-Newtonian flow, non-zero Reynolds numbers, and transient flow, a Galerkin formulation of the governing equations is chosen, rather than an extremum principle. The resulting program is used to solve the Newtonian die-swell problem for creeping jets free of surface tension constraints. The authors conclude that a Newtonian jet expands about 13%, in substantial agreement with experiments made with both small finite Reynolds numbers and small ratios of surface tension to viscous forces. The solutions to the related stick-slip problem and the tube inlet problem, both of which also contain stress singularities, are also given. (Modified author abstract) GRA

N74-17992# Calspan Corp., Buffalo, N.Y.
A NUMERICAL DEMONSTRATION OF THE ESTABLISHMENT OF UNCONFINED-FLOW CONDITIONS IN A SELF-CORRECTING WIND TUNNEL
J. C. Erickson, Jr. and J. P. Nenni Nov. 1973 38 p refs Sponsored in part by AFOSR
(Contract N00014-72-C-0102; NR Proj. 061-199)
(AD-771450; CALSPAN-RK-5070-A-1) Avail: NTIS CSCL 14/2

Sears, self-correcting wind tunnel concept for achieving unconfined, interference-free flow conditions about a model by controlling the flow at the test section walls is simulated. A numerical model for the flow within the test section is used in conjunction with the functional relationships which must be satisfied to insure that the flow is unconfined. The basic iterative nature of the concept is examined, and it is demonstrated that the iteration converges readily to unconfined-flow conditions. The effects on the flow about the model of truncating the controllable portion of the test section walls at 4.5 chord lengths up- and downstream of the model quarter chord is shown to be negligible. Author (GRA)

N74-17993# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MOMENT CHARACTERISTICS OF A LOW-ASPECT WING IN A FINITE FLOW OF INVISCID FLUID
V. I. Kholyauko and Yu. F. Usik 30 Nov. 1973 13 p Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 25, 1971 p 3-8
(AD-771979; FTD-HT-23-20-74) Avail: NTIS CSCL 20/4

An analysis is made of the change in the position of pressure and aerodynamic centers of a thin plane low-aspect wing moving close to a solid or free surface (in the case of a hydrofoil). The results of this work are based on general relationships of the theory of a thin body and the approximate solutions. GRA

N74-17994# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVARIANT METHODS OF DETERMINING THE LIFT COEFFICIENT OF VARIOUS AERODYNAMIC PROFILES ACCORDING TO THE FLOW SPECTRUM
V. M. Suprun 30 Nov. 1973 18 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 25, 1971 p 8-14
(AD-772003; FTD-HT-23-172-74) Avail: NTIS CSCL 20/4

Invariant methods are used in wind tunnels and aerodynamic installations with visualization of part of the flow pattern encompassing the necessary section with the characteristic line of flow; in wind tunnels in which visualization is not possible for various reasons; in preliminary studies of a large number of promising types of mechanization (UPS (boundary layer control), pumping or blowing of jet), for which the development of special complex equipment is required for the feeding and exhausting of air through a weighing system and in physical studies of new circulation two-dimensional flows around aerodynamic contours caused by various reasons. GRA

N74-18261 Joint Publications Research Service, Arlington, Va.
ONE-DIMENSIONAL HYDRODYNAMIC MODELS OF OVERLAND RUNOFF
V. N. Demidov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Jul. 1974 p 94-103 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 69-76 (For availability see N74-18252 09-20)

N74-18571 Joint Publications Research Service, Arlington, Va.
ACOUSTICS OF A CONTROLLED BOUNDARY LAYER
L. M. Lyamshev *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 26-38 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 22-31 (For availability see N74-18567 09-34)

N74-18256 Joint Publications Research Service, Arlington, Va.
ON THE FORMULATION AND SOLUTION OF THE INITIAL-VALUE PROBLEM FOR HYDRODYNAMIC EQUATIONS

V. I. Gubin *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 42-48 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 32-37 (For availability see N74-18252 09-20)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-17995*# Geological Survey, Reston, Va.
CARTOGRAPHIC EVALUATION OF SKYLAB-A S-192 SCANNER IMAGES Quarterly Progress Report, 1 Nov. 1973 - 31 Jan. 1974
John D. McLaurin, Principal Investigator 31 Jan. 1974 6 p EREP
(NASA Order T-4111-B)
(E74-10305; NASA-CR-136787) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-17996*# South Dakota State Univ., Brookings. Remote Sensing Inst.
[DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL] Monthly Report, period ending 1 Feb. 1974
Victor I. Myers, Principal Investigator 1 Feb. 1974 3 p EREP
(Contract NAS9-13337)
(E74-10309; NASA-CR-136791) Avail: NTIS HC $4.00 CSCL 08M

There are no author-identified significant results in this report.

N74-17997*# Wisconsin Univ., Madison. Environmental Monitoring and Data Acquisition Group.
EVALUATION OF THE APPLICATION OF ERTS-1 DATA TO THE REGIONAL LAND USE PLANNING PROCESS Progress Report, period ending 1 Feb. 1974
James L. Clapp, Principal Investigator 1 Feb. 1974 25 p ERTS
(Contract NAS5-21754)
(E74-10315; NASA-CR-136800) Avail: NTIS HC $4.25 CSCL 08B

The author has identified the following significant results. Investigators have concentrated on efforts toward assessing the achievements of the current ERTS-1 research so that significant results could be incorporated into the updated version of their ERTS-B research proposal. Significant progress was made in the development of operational mechanisms, linking the research community at the University and the operation agencies of the State of Wisconsin. Efforts have been made to finalize a report which is being prepared for the State of Wisconsin Department of Administration, evaluating the applicability of ERTS-1 to the planning needs of the State of Wisconsin. This document is intended to assess the degree of utility of the satellite for providing information which has been designated by state planners as essential to their needs. This effort is considered highly significant to the overall research program since a situation has been created in which a prime potential user of ERTS type data has been given the opportunity to determine the direction of the research.

N74-17998*# North Carolina State Univ., Raleigh.
UTILIZATION OF ERTS-1 DATA IN NORTH CAROLINA Interim Report, Jun. - Nov. 1973
Charles W. Welby, Principal Investigator, J. O. Lammi, and R. J. Carson, III Jan. 1973 48 p refs ERTS
(Contract NAS5-21732)
(E74-10317; NASA-CR-136806) Avail: NTIS HC $5.50 CSCL 08B

The author has identified the following significant results. ERTS-1 imagery has been used to study forested wetlands, dynamic processes off Coastal North Carolina, and land use patterns in the Wilmington, North Carolina area. The thrust of the investigation is still involvement of state and regional agencies in the use of ERTS-1 imagery in solving some of their day-to-day problems.

N74-17999*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF ERTS-A DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Progress Report, Dec. 1973 - Jan. 1974
Charles W. Welby, Principal Investigator 15 Feb. 1974 24 p
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21732)
(E74-10320; NASA-CR-136811) Avail: NTIS HC $4.25 CSCL 08G

There are no author-identified significant results in this report.

N74-18000*# North Carolina State Univ., Raleigh. Dept. of Forestry.
URBAN GREEN SPACE STUDIES WITH ERTS-1 IMAGERY Progress Report, Dec. 1973 - Jan. 1974
Charles W. Welby, Principal Investigator and J. O. Lammi 22 Jan. 1974 2 p ERTS
(Contract NAS5-21732)
(E74-10322; NASA-CR-136813) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-18001*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Feb. 1974
Joe R. Eagleman, Ernest C. Pogge, Richard K. Moore, Principal Investigators, Norman Hardy, Wen Lin, and Larry League Feb. 1974 11 p EREP
(Contract NAS9-13273)
(E74-10325; NASA-CR-136820) Avail: NTIS HC $4.00 CSCL 08M

The author has identified the following significant results. Data from five Skylab passes were combined to give a composite relationship between the S194 antennae temperature and soil moisture content in the surface to one inch layer. The five data sets were comparable and resulted in a correlation coefficient of -0.97. The regression equation was used to predict soil moisture content across the United States for one particular pass on August 5, 1973.

N74-18002*# South Dakota State Univ., Brookings. Remote Sensing Inst.
[DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL] Monthly Report, period ending 1 Nov. 1973
Victor I. Myers, Principal Investigator 1 Nov. 1973 2 p EREP
(Contract NAS9-13337)
(E74-10326; NASA-CR-136821) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-18003*# Stanford Univ., Calif. Remote Sensing Lab.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, 2 Sep. - 2 Nov. 1973
R. J. P. Lyon, A. A. Green, and F. R. Honey, Principal Investigators 2 Nov. 1973 3 p EREP
(Contract NAS9-13357)

(E74-10327; NASA-CR-136822; MR-3; MR-4) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-18004*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 10 Nov. - 10 Dec. 1973
Kenneth Savastano, Principal Investigator 5 Dec. 1973 5 p EREP
(NASA Order T-8217-B)
(E74-10328; NASA-CR-136823; MPR-7) Avail: NTIS HC $4.00

There are no author-identified significant results in this report.

N74-18005*# Bureau of Sport Fisheries and Wildlife, Jamestown, N.D. Northern Prairie Wildlife Research Center.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Feb. 1974
Harvey K. Nelson, Principal Investigator Feb. 1974 3 p EREP
(NASA Order T-4114-B)
(E74-10329; NASA-CR-136824) Avail: NTIS HC $4.00 CSCL 06C

There are no author-identified significant results in this report.

N74-18006*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO USING ERTS-1 DATA Progress Report, 1 Jun. - 30 Nov. 1973
Daniel H. Knepper, Principal Investigator, R. M. Hutchinson, D. L. Sawatzky, D. W. Trexler, D. L. Bruns, and S. M. Nicolais Dec. 1973 61 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21778)
(E74-10330; NASA-CR-136825; Rept-73-5; PR-9) Avail: NTIS HC $6.25 CSCL 08F

The author has identified the following significant results. Topography was found to be the most important factor defining folds on ERTS-1 imagery of northwestern Colorado; tonal variations caused by rock reflectance and vegetation type and density are the next most important factors. Photo-linears mapped on ERTS-1 imagery of central Colorado correlate well with ground-measured joint and fracture trends. In addition, photo-linears have been successfully used to determine the location and distribution of metallic mineral deposits in the Colorado Mineral Belt. True color composites are best for general geologic analysis and false color composites prepared with positive/negative masks are useful for enhancing local geologic phenomena. During geologic analysis of any given area, ERTS-1 imagery from several different dates should be studied.

N74-18007*# Eason Oil Co., Oklahoma City, Okla.
EVALUATION OF THE SUITABILITY OF SKYLAB DATA FOR THE PURPOSE OF PETROLEUM EXPLORATION Quarterly Report, Oct. - Dec. 1973
Robert J. Collins, Principal Investigator Dec. 1973 4 p EREP (Contract NAS9-13297)
(E74-10331; NASA-CR-136842) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-18008*# National Marine Fisheries Service, Bay Saint Louis, Miss. Fisheries Engineering Lab.
INVESTIGATION USING DATA FROM ERTS-1 TO DEVELOP AND IMPLEMENT UTILIZATION OF LIVING MARINE RESOURCES Final Report, 1 Jul. 1972 - 4 Oct. 1973
William H. Stevenson, Principal Investigator and E. J. Pastula, Jr. Dec. 1973 198 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70246-AG)
(E74-10332; NASA-CR-136843) Avail: NTIS HC $13.00 CSCL 08A

The author has identified the following significant results. This 15-month ERTS-1 investigation produced correlations between satellite, aircraft, menhaden fisheries, and environmental sea truth data from the Mississippi Sound. Selected oceanographic, meteorological, and biological parameters were used as indirect indicators of the menhaden resource. Synoptic and near real time sea truth, fishery, satellite imagery, aircraft acquired multispectral, photo and thermal IR information were acquired as data inputs. Computer programs were developed to manipulate these data according to user requirements. Preliminary results indicate a correlation between backscattered light with chlorophyll concentration and water transparency in turbid waters. Eight empirical menhaden distribution models were constructed from combinations of four fisheries-significant oceanographic parameters: water depth, transparency, color, and surface salinity. The models demonstrated their potential for management utilization in areas of resource assessment, prediction, and monitoring.

N74-18009*# Wyoming Univ., Laramie. Dept. of Geology.
LOCATION OF GEOLOGIC STRUCTURES FROM INTERPRETATION OF ERTS-1 IMAGERY, CARBON COUNTY, WYOMING Special Report
R. W. Marrs and R. Barton 5 Mar. 1974 11 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E74-10333; NASA-CR-136844; ERTS-1-S-74-2) Avail: NTIS HC $4.00 CSCL 08G

The author has identified the following significant results. Possible geologic structures in the basin sediments of Carbon County and vicinity were located by interpretation of ERTS-1 imagery. These same structures are not evident on existing conventional geologic maps of the area. Subsequent field checks confirmed much of the geologic interpretation, but revealed that two apparent closed structures identified on the ERTS-1 imagery were actually topographic pseudostructures in flat or homoclinal sediments. Stereoscopic coverage (where available) allows the interpreter to avoid such misinterpretations.

N74-18010*# Agricultural Research Service, Weslaco, Tex.
REFLECTANCE OF VEGETATION, SOIL, AND WATER Progress Report, 19 Dec. 1973 - 19 Feb. 1974
Craig L. Wiegand, Principal Investigator 20 Feb. 1974 5 p ERTS
(NASA Order S-70251-AG)
(E74-10334; NASA-CR-136845; PR-6) Avail: NTIS HC $4.00 CSCL 08M

There are no author-identified significant results in this report.

N74-18011*# Mississippi State Univ., State College. Inst. for Environmental Studies.
APPLICATION OF ERTS-A DATA TO AGRICULTURAL PRACTICES IN THE MISSISSIPPI DELTA REGION Progress Report
C. W. Bouchillon, Principal Investigator 5 Mar. 1974 2 p ERTS
(Contract NAS5-21881)
(E74-10335; NASA-CR-136846; PR-6) Avail: NTIS HC $4.00 CSCL 02C

There are no author-identified significant results in this report.

N74-18012*# Earth Satellite Corp., Washington, D.C.
STUDY OF APPLICATION OF ERTS-A IMAGERY TO FRACTURE-RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY Progress Report, 1 Jan. - 1 Mar. 1974
Charles E. Wier, Frank J. Wobber, Principal Investigators, Orville R. Russell, Roger V. Amato, and Thomas V. Leshendok 26 Feb. 1974 5 p Prepared in cooperation with Indiana Geol. Survey ERTS

(Contract NAS5-21795)
(E74-10336; NASA-CR-136847) Avail: NTIS HC $4.00 CSCL 08I

The author has identified the following significant results. The mine refuse inventory maps were prepared in response to a need by both the State and the coal industry. The lack of information on the scope of the problem handicapped all people concerned in drafting realistic legislation for a severance tax on coal production to raise funds for restoration of refuse sites. The inventory was conducted rapidly and economically, and demonstrated the benefits which can be derived through remote sensing methods.

N74-18013*# Kennecott Exploration, Inc., Salt Lake City, Utah. Exploration Services Dept.
RECOGNITION OF THE GEOLOGIC FRAMEWORK OF PORPHYRY COPPER DEPOSITS ON ERTS-1 IMAGERY Progress Report, Jan. - Feb. 1974
John C. Wilson, Principal Investigator Feb. 1974 1 p ERTS
(Contract NAS5-21769)
(E74-10337; NASA-CR-136848) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-18014*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 10 Jul. - 10 Aug. 1973
Kenneth Savastano and William H. Stevenson, Principal Investigators 14 Aug. 1973 5 p EREP
(NASA Order T-8217-B)
(E74-10338; NASA-CR-136849, MPR-3) Avail: NTIS HC $4.00 CSCL 08A

There are no author-identified significant results in this report.

N74-18015*# New York State Museum and Science Service, Albany.
TO EVALUATE ERTS-1 DATA FOR USEFULNESS AS A GEOLOGICAL SENSOR IN THE DIVERSE GEOLOGICAL TERRANES OF NEW YORK STATE Progress Report, Jan. - Feb. 1974
Yngvar W. Isachsen, Principal Investigator 28 Feb. 1974 7 p ERTS
(Contract NAS5-21764)
(E74-10339; NASA-CR-136850) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-18016*# Research Triangle Inst., Research Triangle Park, N.C.
[RADAR BACKSCATTERING AS A MEANS FOR MEASURING OCEAN SURFACE PARAMETERS USING S193 ALTIMETRY AND S190B PHOTOGRAPHY] Monthly Progress Report, 1-31 Aug. 1973
Lee S. Miller and Gary S. Brown, Principal Investigators 12 Sep. 1973 2 p EREP
(Contract NAS9-13304)
(E74-10340; NASA-CR-136852) Avail: NTIS HC $4.00 CSCL 08J

There are no author-identified significant results in this report.

N74-18017*# Boeing Co., Kent, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Jul. 1973
David L. Tingey, Principal Investigator Jul. 1973 2 p EREP
(Contract NAS9-13303)
(E74-10341; NASA-CR-136853) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-18018*# Kansas Univ. Center for Research, Inc., Lawrence. Geological Survey.
KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL. MONITORING FRESH WATER RESOURCES Semiannual Progress Report, Aug. 1973 - Jan. 1974
Harold L. Yarger, Principal Investigator and James R. McCauley Feb. 1974 19 p ERTS
(Contract NAS5-21822)
(E74-10342; NASA-CR-136854; SAPR-3) Avail: NTIS HC $4.00 CSCL 08H

The author has identified the following significant results. Processing and analysis of CCT's for numerous ground truth supported passes over Kansas reservoirs has demonstrated that sun angle and atmospheric conditions are strong influences on water reflectance levels as detected by ERTS-1 and can suppress the contributions of true water quality factors. Band ratios, on the other hand, exhibit very little dependence on sun angle and sky conditions and thus are more directly related to water quality. Band ratio levels can be used to reliably determine suspended load. Other water quality indicators appear to have little or no affect on reflectance levels.

N74-18019*# Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
GROUND SURVEY OF ACTIVE CENTRAL AMERICAN VOLCANOES IN NOVEMBER - DECEMBER 1973 Progress Report, Nov. 1973 - Jan. 1974
Richard E. Stoiber, Principal Investigator and William I. Rose, Jr. (Mich. Technol. Univ.) Feb. 1974 18 p EREP
(Contract NAS9-13311)
(E74-10343; NASA-CR-136855) Avail: NTIS HC $4.00 CSCL 08F

The author has identified the following significant results. Thermal anomalies at two volcanoes, Santiaguito and Izalco, have grown in size in the past six months, based on repeated ground survey. Thermal anomalies at Pacaya volcano have became less intense in the same period. Large (>500 m diameter) thermal anomalies exist at 3 volcanoes presently, and smaller scale anomalies are found at nine other volcanoes.

N74-18020*# Naval Oceanographic Office, Washington, D.C.
EARTH RESOURCES TECHNOLOGY SATELLITE DRIFT BUOY PROGRAM Final Report
Robert Kee, Principal Investigator 21 Jan. 1974 13 p ERTS
(NASA Order S-70262-AG)
(E74-10344; NASA-CR-136856) Avail: NTIS HC $4.00 CSCL 08C

There are no author-identified significant results in this report.

N74-18021*# Tennessee Univ., Knoxville. Dept. of Geography.
THE USES OF ERTS-1 IMAGERY IN THE ANALYSIS OF LANDSCAPE CHANGE
John B. Rehder, Principal Investigator 8 Mar. 1974 14 p refs Presented at the 3d Ann. Remote Sensing of Earth Resources Conf., Tullahoma, Tenn., 25-27 Mar. 1974 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21726)
(E74-10346; NASA-CR-136858) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. The analysis of strip mining from ERTS-1 data has resulted in the mapping of landscape changes for the Cumberland Plateau Test Site. Several mapping experiments utilizing ERTS-1 data have been established for the mapping of state-wide land use regions. The first incorporates 12 frames of ERTS-1 imagery for the generalized thematic mapping of forest cover for the state of Tennessee. In another mapping effort, 14 ERTS-1 images have been analyzed for plowed ground signatures to produce a map of agricultural regions for Tennessee, Kentucky, and the northern portions of Mississippi and Alabama. Generalized urban land use categories and transportation networks have been determined from ERTS-1 imagery for the Knoxville Test Site. Finally, through the analysis of ERTS-1 imagery, short-lived phenomena such as the 1973 spring floods on the Mississippi

River in western Tennessee, have been detected, monitored, and mapped.

N74-18022*# Delaware Univ., Newark. Coll. of Marine Studies.
COMPARISON OF ERTS-1 AND SKYLAB-EREP FOR INTERDISCIPLINARY COASTAL INVESTIGATIONS Report on Significant Results.
V. Klemas, Principal Investigator and D. Bartlett 12 Mar. 1974 2 p ERTS
(Contract NAS5-21837)
(E74-10347; NASA-CR-136859) Avail: NTIS HC $4.00 CSCL 08C

The author has identified the following significant results. NASA's ERTS-1 satellite and Skylab EREP have both provided imagery suitable for investigating coastal vegetation, land use, current circulation, water turbidity, waste disposal, and sea state. Based on high contrast targets, such as piers and breakwaters, the ERTS-1 MSS seems to have a resolution of 70-100 meters, Skylab's S190A about 30-70 meters, and its S190B about 10-30 meters. Important coastal land use details can be more readily mapped using Skylab's imagery. On the other hand, the regular eighteen day cycle of ERTS-1 allows observation of important manmade and natural changes, and facilitates collection of ground truth. The Skylab/EREP multispectral scanner offers 13 spectral bands as compared to 4 bands on ERTS-1. However, EREP scanner tapes require special filtering to remove several types of noise and their conical line scan pattern must be linearized before one can identify small targets based on spatial features.

N74-18023*# Nebraska Univ., Lincoln.
PROPOSAL TO EVALUATE THE USE OF ERTS-1 IMAGERY IN MAPPING AND MANAGING SOIL AND RANGE RESOURCES IN THE SAND HILLS REGION OF NEBRASKA Progress Report, 1 Jan. - 1 Mar. 1974
James V. Drew, Principal Investigator 1 Mar. 1974 11 p ref ERTS
(Contract NAS5-21756)
(E74-10348; NASA-CR-136865) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. Increase in radiance values is directly related to decrease in vegetative biomass, though not in a linear manner. Should the relationship hold true over an entire growing season, this would allow an extremely rapid evaluation of range condition. Computer access by remote terminal would allow production of this type of range condition evaluation in near real time, which is essential if grazing practice decisions are to be made based on satellite imagery acquisition. Negating the manipulation of photographic products appears to be the logical way to provide satellite imagery data to the user in near real time. There appears to be a direct linear relationship between radiance values of bands 4 and 5 and increase in total inorganic ions (6 ions) of lakes in the Sand hills region. Consistent ion concentration of lakes during the year could allow their radiance values to serve as a means of equating radiance values from image to image.

N74-18024*# Oregon State Univ., Corvallis. Agricultural Experiment Station.
INVENTORY AND ANALYSIS OF NATURAL VEGETATION AND RELATED RESOURCES FROM SPACE AND HIGH ALTITUDE PHOTOGRAPHY Remote Sensing Applications in Forestry. Final Report
Charles E. Poulton Berkeley, Calif. Calif. Univ. Forestry Remote Sensing Lab. 30 Sep. 1972 63 p refs Prepared for Calif. Univ., Berkeley. Forestry Remote Sensing Lab. in cooperation with Dept. of Agric. Forest Serv.
(NASA Order R-09-038-002)
(NASA-CR-137148) Avail: NTIS HC $6.25 CSCL 02F

A multiple sampling technique was developed whereby spacecraft photographs supported by aircraft photographs could be used to quantify plant communities. Large scale (1:600 to 1:2,400) color infrared aerial photographs were required to identify shrub and herbaceous species. These photos were used to successfully estimate a herbaceous standing crop biomass. Microdensitometry was used to discriminate among specific plant communities and individual plant species. Large scale infrared photography was also used to estimate mule deer deaths and population density of northern pocket gophers. Author

N74-18025*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES Semiannual Progress Report
31 Dec. 1973 304 p refs
(Grant NGL-05-003-404)
(NASA-CR-136945) Avail: NTIS HC $18.25

University of California investigations to determine the usefulness of modern remote sensing techniques have concentrated on the water resources of the state. The studies consider in detail the supply, demand, and impact relationships. For individual titles, see N74-18026 through N74-18035.

N74-18026* California Univ., Berkeley.
INTRODUCTION
Robert N. Colwell *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 7 p (For availability see N74-18025 09-13)
CSCL 08F

Since May 1970, personnel on several campuses of the University of California have been conducting investigations which seek to determine the usefulness of modern remote sensing techniques for studying various components of California's earth resources complex. Emphasis has been given to California's water resources as exemplified by the Feather River project and other aspects of the California Water Plan. This study is designed to consider in detail the supply, demand, and impact relationships. The specific geographic areas studied are the Feather River drainage in northern California, the Chino-Riverside Basin and Imperial Valley areas in southern California, and selected portions of the west side of San Joaquin Valley in central California. An analysis is also given on how an effective benefit-cost study of remote sensing in relation to California's water resources might best be made. A.L.

N74-18027* California Univ., Davis.
WATER SUPPLY STUDIES
Robert H. Burgy, Vidal R. Algazi, William C. Draeger, C. W. Churchman, Randall W. Thomas, Donald T. Lauer, Ida Hoos, Paul F. Krumpe, James D. Nichols, and Michael J. Gialdini *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 110 p refs (For availability see N74-18025 09-13)
CSCL 08H

The primary test site for water supply investigations continues to be the Feather River watershed in northeastern California. This test site includes all of the area draining into and including the Oroville Reservoir. The principal effort is to determine the extent to which remote sensing techniques, when properly employed, can provide information useful to those persons concerned with the management and planning of lands and facilities for the production of water, using the Oroville Reservoir and the California Water Project as the focus for the study. In particular, emphasis is being placed on determining the cost effectiveness of information derived through remote sensing as compared with that currently being derived through more conventional means. A.L.

N74-18028* California Univ., Riverside.
WATER DEMAND STUDIES
L. W. Bowden, J. E. Estes, C. W. Churchman, C. W. Johnson, J. R. Huning, K. Rozelle, J. Hamilton, G. Washburn, L. R. Tinney, and R. R. Thaman *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 71 p refs (For availability see N74-18025 09-13)
CSCL 08H

The areas of focus of the Santa Barbara and Riverside groups in conducting water demand studies are the central and southern California regional test sites, respectively. Within each test site, sub-areas have been selected for use in the making of detailed investigations. Within each of these sub-areas an in-depth evaluation is being made as to the capability of remote sensing systems to provide pertinent data relative to water demand phenomena. These more limited sub-areas are: (1) Kern County and the San Joaquin Basin; (2) Chino-Riverside Basin; and (3)

the Imperial Valley. Rational for the selection of these subareas included the following: Much of the previous remote sensing research had been conducted in these areas and therefore a great deal of remote sensing imagery and pertinent ground truth for the areas was already available. A.L.

N74-18029* California Univ., Berkeley.
WATER IMPACT STUDIES
Robert N. Colwell *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 3 p (For availability see N74-18025 09-13)
CSCL 08H

An investigation has begun into the potential impact of using modern remote sensing techniques as an aid in managing, even on a day-to-day basis, the storage, flow, and delivery of water made available through the California Water Project. It is obvious that the amount of this impact depends upon the extent to which remote sensing is proven to be useful in improving predictions of both the amount of water that will be available and the amount that will be needed. It is also proposed to investigate the potential impact of remote sensing techniques as an aid in monitoring, and perhaps even in directing, changes in land use and life style being brought about through the increased availability of water in central and southern California as a result of the California Water Project. The impact of remote sensing can be of appreciable significance only if: (1) the induced changes are very substantial ones; (2) remote sensing is found, in this context, to be very useful and potentially very cost effective; and (3) resource managers adopt this new technology. Analyses will be conducted of the changing economic bases and the new land use demands resulting from increased water availability in central and southern California. A.L.

N74-18030* California Univ., Berkeley. Dept. of Business Administration.
ON THE FEASIBILITY OF BENEFIT-COST ANALYSIS APPLIED TO REMOTE SENSING PROJECTS Special Study No. 1
Leonard Merewitz *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 7 p refs (For availability see N74-18025 09-13)
CSCL 05A

The following step-wise procedure for making a benefit-cost analysis of using remote sensing techniques could be used either in the limited context of California water resources, or a context as broad as the making of integrated resource surveys of the entire earth resource complex on a statewide, regional, national, or global basis. (1) Survey all data collection efforts which can be accomplished by remote sensing techniques. (2) Carefully inspect the State of California budget and the Budget of the United States Government to find annual cost of data collection efforts. (3) Decide the extent to which remote sensing can obviate each of the collection efforts. (4) Sum the annual costs of all data collection which can be equivalently accomplished through remote sensing. (5) Decide what additional data could and would be collected through remote sensing. (6) Estimate the value of this information. It is not harmful to do a benefit-cost analysis so long as its severe limitations are recalled and it is supplemented with socio-economic impact studies. Author

N74-18031* California Univ., Davis. Dept. of Electrical Engineering.
MULTISPECTRAL COMBINATION AND DISPLAY OF ERTS-1 DATA Special Study No. 2
Vidal Raphael Algazi *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 9 p refs (For availability see N74-18025 09-13)
CSCL 05B

A significant problem in the use of ERTS-1 data is the extraction of information pertinent to each application and the presentation of that information in a form most suitable to users. When the information is to be displayed for visual study by an observer, the problem can be reduced to two steps: (1) Dimensionality reduction, an objective procedure which attempts to preserve most of the ERTS-1 information in a smaller number of components. (2) Display of the reduced number of components for optimum visibility by an observer. A specific dimensionality reduction technique has been applied to ERTS-1 data for several geographical areas in California and distinct types of earth resources. In the display of the reduced number of components, consideration has to be given to properties of the human visual system and the statistics of the data to be displayed. Previous work on digital image enhancement was applied to this problem to generate color composites which contain and display most of the information provided by the ERTS-1 sensors. Results of this approach were interesting, both in terms of the small mean-square caused by the dimensionality reduction, as well as for the examples of enhanced images that have been obtained. Author

N74-18032* California Univ., Los Angeles. Dept. of Planetary and Space Sciences.
POWER LAW TIME DEPENDENCE OF RIVER FLOOD DECAY AND ITS RELATIONSHIP TO LONG TERM DISCHARGE FREQUENCY DISTRIBUTION Special Study No. 3
G. Schubert and R. E. Lingenfelter *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 11 p refs (For availability see N74-18025 09-13)
CSCL 08H

Investigations have continued into the possibility that significant information on stream flow rates can be obtained from aerial and satellite imagery of river meander patterns by seeking a correlation between the meander and discharge spectra of rivers. Such a correlation could provide the basis for a simple and inexpensive technique for remote sensing of the water resources of large geographical areas, eliminating the need for much hydrologic recording. The investigation of the nature of the meander and discharge spectra and their interrelationship can also contribute to a more fundamental understanding of the processes of both river meander formation and drainage of large basins. It has been found that floods decay with an inverse power law dependence on time. The exponent of this dependence varies from river to river and even from station to station along the same river. This power law time dependence makes possible the forecasting of river discharge with an uncertainty of about 5% for as long as a month following the flood peak. Author

N74-18033* California Univ., Davis. Dept. of Agricultural Engineering.
INVESTIGATION OF ATMOSPHERIC EFFECTS IN IMAGE TRANSFER Special Study No. 4 c14
K. L. Coulson and R. L. Walraven *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 33 p refs (For availability see N74-18025 09-13)
CSCL 14E

Investigations have been directed mainly toward: (1) theoretical work oriented toward computations of the effects of atmospheric aerosols on the transfer of images through the atmosphere; (2) measurements of the polarization field in the cloud-free atmosphere as an indicator of the existence and characteristics of atmospheric aerosols; and (3) the design of a video-polarizer system for the detection and display of the polarization field of light utilized in remote sensing of the environment. In addition, a camera system is under development for characterizing the polarization properties of a scene (landscape, city, etc.) by photographic means. Author

N74-18034* California Univ., Berkeley. Center for Remote Sensing Research.
INTERCHANCE AND COOPERATION WITH USER AGENCIES Special Study No. 5 c34
D. T. Lauer *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 27 p (For availability see N74-18025 09-13)
CSCL 05B

It is apparent that the rate of remote sensing technique development is increasing at a much faster pace than is the rate at which these same techniques are being put to practical use by earth resource managers and inventory specialists. It has become increasingly important to bridge this widening gap between remote sensing specialists and potential users. Members of the University of California project on remote sensing of earth resources have been actively participating in efforts to overcome this gap by maintaining library facilities, disseminating research

findings, training remote sensing specialists, and interacting with resource managers. A.L.

N74-18035* California Univ., Berkeley.
SUMMARY
R. N. Colwell *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 20 p (For availability see N74-18025 09-13)
CSCL 05B

University of California activities in the development of remote sensing techniques and their application in the study of water resources within the state are summarized. It is pointed out that the summary is very lengthy due to fact that NASA had requested a dramatic reorientation of the study. For this reason it was felt that the co-investigators and other participants, need a rather detailed and systematic tabulation of the relevant facts that have been uncovered during the period since the reorientation. A.L.

N74-18036*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE INFLUENCE OF THE SURFACE AND BODY TIDES ON THE MOTION OF A SATELLITE
Peter Musen Dec. 1973 24 p refs
(NASA-TM-X-70595; X-920-73-382) Avail: NTIS HC $4.25 CSCL 08C

Some geophysical aspects of the tidal perturbations in the motion of artificial satellites are investigated and a system of formulas is developed that is convenient for computation of the tidal effects in the elements using a step-by-step numerical integration. Author

N74-18037*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ADVANCES IN WATER RESOURCES MONITORING FROM SPACE
Vincent V. Salomonson Feb. 1974 23 p refs
(NASA-TM-X-70600; X-913-74-44) Avail: NTIS HC $4.25 CSCL 08H

Nimbus-5 observations indicate that over the oceans the total precipitable water in a column of atmosphere can be estimated to within + or - 10%, the liquid water content of clouds can be estimated to within + or - 25%, areas of precipitation can be delineated, and broad estimates of the precipitation rate obtained. ERTS-1 observations permit the measurement of snow covered area to within a few percent of drainage basin area and snowline altitudes can be estimated to within 60 meters. Surface water areas as small as 1 hectare can be inventoried over large regions such as playa lakes region of West Texas and Eastern New Mexico. In addition, changes in land use on water-sheds occurring as a result of forest fires, urban development, clear cutting, or strip mining can be rapidly obtained. Author

N74-18038# Geneva Univ. (Switzerland).
BULLETIN OF INFORMATION OF THE EARTH SCIENCE SECTION OF THE UNIVERSITY OF GENEVA [BULLETIN D'INFORMATION DE LA SECTION DES SCIENCES DE LA TERRE DE L'UNIVERSITE DE GENEVE]
Dec. 1973 98 p refs In FRENCH
(Rept-5) Avail: NTIS HC $8.00

Earth science research at the University of Geneva during 1973 is summarized. Data cover mineralogy, petrophysics, geology, chemistry, and paleontology. Transl. by E.H.W.

N74-18039*# National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
CORRECTING AIRBORNE SCANNING INFRARED RADIOMETER MEASUREMENTS FOR ATMOSPHERIC EFFECTS
Robert D. Boudreau Sep. 1972 43 p refs
(NASA-TM-X-69940; ERL-029) Avail: NTIS HC $5.25 CSCL 08J

Two techniques were developed for determining atmospheric corrections from observations made by a scanning radiometer. Both techniques depend on knowing the radiometer's limb function. The limb function for an RS-18 scanning radiometer is derived from calculations made with a radiation model and used to demonstrate the techniques. One technique requires observations made over an isothermal water surface within the area being remotely sensed. The other technique does not depend on an isothermal water surface but requires a boat measurement of radiometric sea surface temperature within the area being remotely sensed. The radiation model used to derive the limb function does not account for the effects of atmospheric particulates on the correction. It is hypothesized that the effect of particulates on the limb function derived in this study is negligible, and therefore the technique essentially obtains the total correction. The techniques developed can be used over land provided that a section of isothermal land exists within the experiment area or that a radiometric measurement of surface temperature is made at the surface. Author

N74-18040*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REMOTE SENSING IN AGRICULTURE
Sanford W. Downs, Jr. 12 Feb. 1974 30 p refs Original contains color illustrations
(NASA-TM-X-64803) Avail: NTIS HC $4.50 CSCL 08F

Some examples are presented of the use of remote sensing in cultivated crops, forestry, and range management. Areas of concern include: the determination of crop areas and types, prediction of yield, and detection of disease; the determination of forest areas and types, timber volume estimation, detection of insect and disease attack, and forest fires; and the determination of range conditions and inventory, and livestock inventory. Articles in the literature are summarized and specific examples of work being performed at the Marshall Space Flight Center are given. Primarily, aerial photographs and photo-like ERTS images are considered. Author

N74-18041# International Geophysical Year World Data Center A, Asheville, N.C.
AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE (11) FOR 1969
Joe Haskell Allen, Carl C. Abston, and Leslie D. Morris Environ. Data Service Feb. 1974 147 p refs Sponsored by NOAA (UAG-31) Avail: NTIS MF $1.45; National Climatic Center, Federal Building, Asheville, N. C. 28801. Attn: Publications HC $0.75

The auroral electrojet index (AE) is discussed and a brief description is given of the derivation of 11-station 2.5-min AE indices for 1969. Tables are given of hourly average indices for each day of the year, of the stations making the main contribution to the hourly indices, and of the average monthly quiet-time level of horizontal fields at each magnetic observatory. Graphs of the index variations are included for each day of 1969. Author

N74-18042# Defence Research Establishment Valcartier (Quebec).
INFRARED RADIATION MEASUREMENTS OF ARCTIC TARGETS AND BACKGROUNDS RECORDED AT RESOLUTE BAY, NORTHWEST TERRITORIES, MAY 1972
D. McKinnon Mar. 1973 84 p refs
(DREV Proj. 97-82-06)
(DREV-TN-2058/73) Avail: NTIS HC $7.25

A survey of the infrared radiation characteristics of representative Arctic targets and backgrounds was conducted at Resolute Bay, NWT, in May 1972. Thermograms of buildings, vehicles, fuel storage areas, humans and animals were recorded at 3-5 micrometers and 8-13 micrometers against snow. Thermal contrast degradation with range in ice fog was investigated on one occasion. Several materials that could be carried in an aircraft also were deployed on snow to evaluate their potential as thermal sources that would draw the attention of a sensor observer during search operations. The results of the survey show that the apparent snow background temperature in May under daylight conditions is relatively uniform over wide areas. Targets such as buildings, vehicles, fuel tanks, humans, and dogs offer contrast to show of several degrees. Thermal imagers should be useful tools for airborne surveillance, reconnaissance, and search in the Arctic during the winter season. Author

N74-18043# Ionospharen-Institut Breisach (West Germany).
IONOSPHERIC MEASUREMENTS WITH RADIO SIGNALS

FROM A BEACON SATELLITE
Christian Muenther 1 May 1973 248 p refs In GERMAN; ENGLISH summary
(IIB-22) Avail: NTIS HC $15.50

From October 1964 to December 1969 amplitude and frequency measurements on the signal of the beacon satellite Explorer 22 have been performed. The frequencies 20, 40 and 41 MHz have been monitored on a rather regular base. This period includes the changes from weak to strong solar activity. Methods for computing the total electron content by use of the Faraday effect, error estimations, and numerical problems are described. The determination of the total number of rotations is treated. During five years 2500 values of the total electron content have been evaluated. These clearly show a relation with solar data despite the scatter of the single values from day to day. Some tables are given which display the various relations between total electron content, solar zenith angle, and solar activity. Daily and seasonal variations have been treated by Fourier analysis. Using these results a formula was set up, by means of which the electron content can be computed as function of hour, day, and solar activity. Author

N74-18044# Joint Publications Research Service, Arlington, Va.
DISCRIMINATION OF GEOPHYSICAL ANOMALIES WITH THE AID OF SELF-LEARNING FILTERS
G. V. Demura, O. P. Lukina, A. A. Nikitin, and A. G. Tarkhov 25 Feb. 1974 11 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Geol. i Razvedka (Moscow), no. 9, 1973 p 103-109
(JPRS-61302) Avail: NTIS HC $4.00

A description is given of the use of certain self-learning systems for the detection and classification of geophysical anomalies. Author

N74-18045*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
EARTH RESOURCES APPLICATIONS OF THE SYNCHRONOUS EARTH OBSERVATORY SATELLITE (SEOS) Final Report, 21 May - 15 Oct. 1973
D. S. Lowe, J. J. Cook et al Dec. 1973 309 p refs
(Contract NAS5-21937)
(NASA-CR-132933; ERIM-103500-1-F) Avail: NTIS HC $18.50 CSCL 05B

The results are presented of a four month study to define earth resource applications which are uniquely suited to data collection by a geosynchronous satellite. While such a satellite could also perform many of the functions of ERTS, or its low orbiting successors, those applications were considered in those situations where requirements for timely observation limit the capability of ERTS or EOS. Thus, the application presented could be used to justify a SEOS. Author

N74-18046# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, NOVEMBER 1973 [IONOSPHEREN-DATEN, VERTIKAL-ECHO-LOTUNG: FREIBURG, URSI-CODE 131, NOVEMBER 1973]
Nov. 1973 44 p ref
(Rept-329-F) Avail: NTIS HC $5.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere during November, 1973. The data include charts of median values for the E and F regions. Author

N74-18047*# Smithsonian Institution, Washington, D.C. Chesapeake Bay Center for Environmental Studies.
COLLECTION AND ANALYSIS OF REMOTELY SENSED DATA FROM THE RHODE RIVER ESTUARY WATERSHED Annual Report, 10 Oct. 1971 - 10 Oct. 1972
Dale W. Jenkins and Francis S. L. Williamson Oct. 1973 74 p refs
(Contract NAS6-1913)
(NASA-CR-62094) Avail: NTIS HC $6.75 CSCL 08H

The remote sensing study to survey the Rhode River watershed for spray irrigation with secondarily treated sewage is reported. The standardization of Autumn coloration changes with Munsell color chips is described along with the mapping of old field vegetation for the spray irrigation project. The interpretation and verification of salt marsh vegetation by remote sensing of the water shed is discussed. F.O.S.

N74-18048# Lockheed Missiles and Space Co., Palo Alto, Calif.
BOUNDARY DISCONTINUITIES AND MODELS OF THE FLOW AROUND THE MAGNETOSPHERE
K. G. Ivanov 1973 7 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 13, no. 6, 1973 p 1069-1074
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60676

The magnetosphere is considered to be permanently open as a result of the application of anisotropic magnetohydrodynamics to the analysis of the boundary magnetospheric discontinuities. The flow around the magnetosphere for open and closed magnetospheric models is discussed along with an analysis of the field and plasma measurements on the boundary of hydromagnetic discontinuities. The results indicate that the permanently open magnetospheric model with anisotropic contact or rational discontinuity on the boundary is not eliminated by modern experimental studies, and merits further research. F.O.S.

N74-18049# Los Alamos Scientific Lab., N.Mex.
MATHEMATICAL MODEL FOR THE TRANSPORT OF ENVIRONMENTAL PLUTONIUM
J. R. Travis [1973] 7 p refs Presented at Joint Meeting of the Am. Nucl. Soc. and the Atomic Ind. Forum and Nucl. Energy Exhibition, San Francisco, 11 Nov. 1973 Submitted for publication
(Contract W-7405-eng-36)
(LA-UR-73-954; Conf-731101-16) Avail: NTIS HC $3.00

A mathematical model describing the behavior of particulate Pu in the lower atmosphere is proposed which accounts for particles settling or impinging on the earth's surface as well as particle re-entrainment or resuspension. The assumptions used and system of equations derived are discussed. Author (NSA)

N74-18050# Battelle-Northwest, Richland, Wash. Pacific Northwest Labs.
APPLICATION OF IDEAL REACTORS TO STUDIES IN ATMOSPHERIC CHEMISTRY
J. M. Hales, J. O. Wilkes, and J. L. York Aug. 1973 37 p refs
(Contract AT(45-1)-1830)
(BNWL-1773) Avail: NTIS HC $4.00

Mass-transfer effects and surface reactions may severely obscure the observation of homogeneous chemical reaction rates from experimental reactor data. Such problems are particularly pertinent to studies in the atmospheric sciences, owing to the tendency for increased surface-reaction interference at the low concentrations usually of interest. Criteria are presented for ideal behavior in three basic types of experimental reactors. Under conditions satisfying these criteria the effects of competing surface reactions can be accounted for quantitatively, allowing the true homogeneous effect to be observed. Data from tubular reactors can be analyzed accurately even under some nonideal conditions. The available solutions to tubular reactor models useful for this purpose were compiled and tabulated. Author (NSA)

N74-18051# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany). Inst. fuer Stratosphaerenphysik.
DIRECT PARTICLE MEASUREMENTS IN THE MORNING SECTOR OF THE POLAR AURORAL ZONE [DIREKTE TEILCHENMESSUNGEN IM MORGENSEKTOR DER POLARLICHTZONE]
Wolfgang Stuedemann Springer Verlag 1972 69 p refs In GERMAN; ENGLISH summary
(Rept-49/1972) Avail: NTIS HC $6.50

Measurements of high energy electrons and protons during two rocket flights, using a special electron-proton spectrometer, are presented. Features studied in detail include morphology of the electron and proton precipitation at the maximum and at end of a slowly varying absorption event using a high time resolution, characteristic changes of the steepness of the proton energy spectra during the increase of the electron precipitation, and constancy of the steepness of the proton energy spectra

between the two rocket flights (90 minutes). An electron precipitation mechanism is discussed using results of a statistical survey of the measured electron pitch-angle distributions. ESRO

N74-18052# World Meteorological Organization, Geneva (Switzerland).
THE AIRFLOW OVER MOUNTAINS. RESEARCH 1958-1972
J. M. Nicholls 1973 89 p refs
(WMO-355; TN-127) Avail: NTIS HC $7.50; WMO, Geneva

Developments, since 1958, on disturbances in airflow over and down-wind of mountainous terrain are summarized. Results and field investigation are given of observations of tropospheric and stratospheric airflow and the techniques used are described. Theoretical results are given of the investigation of small and large amplitude theories to explain such features as rotors, upstream blocking, and hydraulic jumps. Finally, a summary is given on the properties of the waves and methods of forecasting them. ESRO

N74-18053# Kiruna Geophysical Observatory (Sweden).
ROCKET OBSERVATIONS OF ENERGY SPECTRA AND PITCH ANGLE DISTRIBUTIONS OF AURORAL ELECTRONS
Rickard Lundin Dec. 1973 36 p refs Sponsored by Swed. Nat. Sci. Res. Council and Swed. Board for Tech. Develop.
(KGO-73-4) Avail: NTIS HC $5.00

Energy spectra and pitch angle distributions of auroral electrons in the energy range 2.5 to 12 keV observed on a rocket flight launched from Andoya into a negative bay on November 13, 1970 are presented. Strong rapidly fluctuating fluxes during the first part of the flight were succeeded by fluxes below or close to the level of detectability. Before the rocket passed through the northern precipitation boundary two spectral events of inverted V character occurred. Both events were associated with anisotropic pitch angle distributions peaked near 0 deg. However, isotropy over the upper hemisphere was the common feature during these inverted V's, while anisotropies peaked near 0 deg were mainly confined to regions of strong gradients of flux intensities. The observations made during these events strongly support the theory of an antiparallel electric field as being the cause of the peaked spectrum and the field aligned distributions of electrons in the inverted V.
Author (ESRO)

N74-18054# Stockholm Univ. (Sweden). Inst. of Meteorology.
DEPOSITION OF SULFATE AND ACID WITH PRECIPITATION OVER NORTHERN EUROPE
Lennart Granat 8 Mar. 1972 51 p refs
(AC-20) Avail: NTIS HC $5.75

The reasons for using excess sulfur and net acid as describing parameters are given. The time and areal distribution of excess sulfur and net acid deposition are summarized. Excess sulfur deposition is decreasing both to the north and to the south from a maximum over Holland and Belgium. The fluctuations in the yearly deposition of excess sulfur are often large but several stations in adjacent areas show similar fluctuations. The areal distribution of excess acid is more complex than that of excess sulfur. There is again a maximum over Holland and Belgium, while Denmark, southern Norway and the west coast of Sweden receive substantial amount of acid. The east coast of Sweden is less exposed. For large areas, the increase of net acid deposition is approximately equivalent to the increase in excess sulfur deposition. Author (ESRO)

N74-18055# Telespazio, S.p.A., Rome (Italy).
DATA PREPROCESSING SYSTEMS FOR EARTH RESOURCES SURVEYS. VOLUME 1: INTRODUCTION TO PREPROCESSING TECHNIQUES
G. Bressanin, J. Erickson et al Paris ESRO Sep. 1973 260 p refs Prepared jointly with Environ. Res. Inst. of Mich. 5 Vol.
(Contract ESTEC-1761/72)
(ESRO-CR-295-Vol-1) Avail: NTIS HC $16.00

Data preprocessing systems as implemented in the framework of a remote sensing information system are reviewed. A description of remote sensors used in gathering earth resources data is presented, giving for each various criteria such as formats, calibration, and correction techniques. Data manipulation techniques such as photographic techniques or analog to digital conversion which precede the data processing proper are described together with data compression methods. Geometric manipulation and image data, preprocessing are covered with several application examples. Feature extraction and classification processing are also considered. ESRO

N74-18056# Telespazio, S.p.A., Rome (Italy).
DATA PREPROCESSING SYSTEMS FOR EARTH RESOURCES SURVEYS. VOLUME 2: METHODS OF IMPLEMENTATION
G. Bressanin, J. Erickson et al Paris ESRO Sep. 1973 188 p refs Prepared jointly with Environ. Res. Inst. of Mich. 5 Vol.
(Contract ESTEC-1761/72)
(ESRO-CR-296-Vol-2) Avail: NTIS HC $12.50

The significant features and requirements of an operational remote sensing information system are described along with the effects of these requirements on the implementation of such a system. Problems encountered in the implementation of algorithms by means of digital, analog and hybrid computers are discussed. The major software packages available for image data processing are reviewed and aspects of data storage and retrieval are discussed. Finally two illustrated examples of data processing systems are given - one on a multispectral scanner and the other on the coherent optical processing of geographical imagery. ESRO

N74-18057# Telespazio, S.p.A., Rome (Italy).
DATA PREPROCESSING SYSTEMS FOR EARTH RESOURCES SURVEYS. VOLUME 3: TECHNICAL APPENDICES
G. Bressanin, J. Erickson, G. Arlette et al Paris ESRO Sep. 1973 91 p refs Prepared jointly with Environ. Res. Inst. of Mich. and Centre d'Informatique Geol. of Ecole Natl. Super. des Mines, Paris 5 Vol.
(Contract ESTEC-1761/72)
(ESRO-CR-297-Vol-3) Avail: NTIS HC $7.75

Specific mathematical aspects of data processing techniques for remote sensing applications are illustrated. Among the aspects covered are image data processing, signature extension techniques, entropy reduction, classification of unresolved objects and sea state optical processing. ESRO

N74-18058# Telespazio, S.p.A., Rome (Italy).
DATA PREPROCESSING SYSTEMS FOR EARTH RESOURCES SURVEYS. VOLUME 4: SUMMARY [SYSTEMES DE PREELABORATION DE DONNEES POUR LA TELEDETECTION DES RESSOURCES TERRESTRES. VOL. 4: SOMMAIRE]
G. Bressanin and J. Erickson Paris ESRO Sep. 1973 31 p In FRENCH; ENGLISH summary Prepared jointly with Environ. Res. Inst. of Mich. 5 Vol.
(Contract ESTEC-1761/72)
(ESRO-CR-298-Vol-4) Avail: NTIS HC $4.75

Data preprocessing systems implemented in a remote sensing information system are given. Data acquisition, data manipulation and compression, imaging techniques, extraction of characteristics, and optical data processing. ESRO

N74-18059# Telespazio, S.p.A., Rome (Italy).
DATA PREPROCESSING SYSTEMS FOR EARTH RESOURCES SURVEYS. VOLUME 5: BIBLIOGRAPHY
V. A. Nigro and L. Piccolomini Paris ESRO Sep. 1973 134 p refs 5 Vol.
(Contract ESTEC-1761/72)
(ESRO-CR-299-Vol-5) Avail: NTIS HC $9.75

The bibliography was compiled with the aim of providing an updated and thorough collection of pertinent literature in the field of image processing and related topics. It is divided into the following areas: image analysis, coding, transmission, enhancement, restoration, and detection. ESRO

N74-18060*# Environmental Research Inst. of Michigan, Ann Arbor.
PROCEEDINGS OF THE 8TH INTERNATIONAL SYMPOSIUM ON REMOTE SENSING OF ENVIRONMENT, VOLUME 2
Jerald J. Cook Oct. 1972 786 p refs Symp. held at Ann

Arbor, Mich., 2-6 Oct. 1972 Sponsored in part by NASA
(Grant AF-AFOSR-2372-72; AF Proj. 9751)
(NASA-CR-137048; AFOSR-73-1120TR-Vol-2; AD-770489; ERIM-195600-1-X-Vol-2) Avail: NTIS HC $42.50 CSCL 08/6

The Proceedings contain papers presented at the Eighth International Symposium on Remote Sensing of Environment, held October 6th, 1972, on the campus of The University of Michigan. The symposium was conducted by the Center for Remote Sensing Information and Analysis of the Environmental Institute of Michigan (formerly the University of Michigan's Willow Laboratories) as a part of a continuing program investigating current activities in the field of remote sensing.
Author (GRA)

N74-18061# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
CRUSTAL STRUCTURE OF CENTRAL AND SOUTHEASTERN EUROPE (FROM EXPLOSION SEISMOLOGY DATA)
V. B. Sollogub, D. Prosen, and H. Militzer Feb. 1973 369 p refs Transl. into ENGLISH of the publ. "Stroenie Zemnoi Kory Tsentralnoi i Yugo-Vostochnoi Evropy (po Dannym Vzryvnoi Seismologii)" Kiev, Dumka, 1971 286 p
(AD-762830; DMAAC-TC-1774) Avail: NTIS HC $21.00 CSCL 08/7

The work represents the first attempt to sum up the study of the crustal structure in Central and Southeastern Europe. A considerable place in the work is occupied by purely seismic questions: the carrying out of field investigations, the analysis of wave fields, the study of the nature of specific waves, the determination of laws in the variation of speed with depth, etc. A description is presented of all the international profiles intersecting the main geological regions of Southeastern Europe. As a result of the generalization of all the materials, an attempt was undertaken for the construction of deep-seated structural schemes of the earth's crust and the establishment of connections between the deep-seated and near-surface structures. The sources of formation of specific geological megastructures and other theoretical problems of geology are considered. GRA

N74-18062# Aerospace Corp., El Segundo, Calif. Lab. Operations.
A COMPARISON OF DENSITIES DEDUCED FROM RADAR-DETERMINED ORBITAL DECAY AND FROM ACCELEROMETER MEASUREMENTS MADE ONBOARD THE LOW ALTITUDE SATELLITE 1970-48A Technical Report, Jul. 1972 - Apr. 1973
Hugo R. Rugge 28 Sep. 1973 30 p refs
(Contract F04701-73-C-0074)
(AD-771480; TR-0074(4260-10)-2; SAMSO-TR-73-349) Avail: NTIS CSCL 04/1

A comparison has been made of atmospheric density as deduced from high resolution radar-determined orbital decay data and from data obtained from a uniaxial MESA accelerometer flown onboard the low altitude satellite 1970-48A. Data were obtained during late June and early July, 1970. The radar-deduced densities, having an effective six hour resolution, were determined at an altitude of 143 km, essentially one-half scale height above perigee. The accelerometer-deduced densities at the same altitude were obtained on both the approaching-perigee and leaving-perigee portion of each of 59 orbits. (Modified author abstract) GRA

N74-18063# Naval Research Lab., Washington, D.C.
OXYGEN RECOMBINATION IN THE TROPICAL NIGHTGLOW
Paul S. Julienne, Jack Davis, and E. Oran Dec. 1973 15 p refs
(WF48222701)
(AD-771368; NRL-MR-2678) Avail: NTIS CSCL 04/1

In order to explain O I lines in the tropical nightglow, complete and reasonably accurate recombination and emission rate coefficients are used to construct a detailed radiative cascade model of a recombining oxygen plasma. Effective recombination coefficients are given for all low quantum number O I levels for the two limiting cases of zero and infinite optical depth of the resonance lines. The direct recombination coefficients for the S levels, and to a lesser extent, the P levels, are significantly smaller than those previously quoted in the literature. The quantitative evaluation of radiative cascading in the optically thin limit predicts an order of magnitude lower intensity for the 1304A line than predicted by a recently published optically thin model using an estimate of the cascade contributions of the intensity. However, the optically thick model, which is more realistic for the F2 region than the thin model, predicts a 1304A intensity in good agreement with observations of the 1304A line.
Author (GRA)

N74-18064# General Electric Co., Santa Barbara, Calif.
REACTION RATE DATA. NUMBER 42. ANNUAL SUMMARY OF PROGRESS IN FY 1973 DNA REACTION RATE PROGRAM
Sep. 1973 56 p
(Contract DNA001-73-C-0019)
(AD-771315) Avail: NTIS CSCL 07/4

The report presents summaries of recent progress reports and other informal information of current interest in the reaction rate field. Most of the reports concern upper atmosphere chemistry, atomic, molecular, and ionic reactions, or reactions of interest to nuclear fireball studies. GRA

N74-18065# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
EXPLANATORY NOTES TO THE LIST OF GRAVIMETRIC DETERMINATIONS MADE ON THE THIRD CRUISE OF THE RESEARCH VESSEL DMITRII MENDELEEV, ATLANTIC OCEAN, 1970
Yu. D. Bulanzhe Oct. 1973 11 p refs Transl. into ENGLISH from the Russian
(AD-770841; DMAAC-TC-1978) Avail: NTIS CSCL 08/5

This paper explains the list of gravimetric determinations made on the third cruise of the research vessel Dmitriy Mendeleyev, Atlantic Ocean, 1970. Two automated marine gravimeters were used and all materials on the cruise were processed from both gravimeters. The results of only one gravimeter are included in this catalog. Author (GRA)

N74-18066# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
NUMERICAL SOLUTION OF THE EQUATIONS OF TIDE DYNAMICS IN THE WORLD OCEAN
R. G. Gordeev, B. A. Kagan, and V. Ya. Rivkind Sep. 1973 11 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 209, no. 2, 1973 p 340-343
(AD-770845; DMAAC-TC-1968) Avail: NTIS CSCL 08/3

In the present work the tides in the World Ocean are computed only according to the outer parameters, namely, from the given distribution of tide-generating forces, the known bottom topography and the coastline configuration. Such a method has already been used; however, in contrast to these works we reject here a number of assumptions in the description of frictional forces, the use of which leads particularly to a significant overstating of the resultant value of dissipation of the tidal energy. GRA

N74-18067*# Dartmouth Coll., Hanover, N.H. Dept. of Geography.
URBAN-FIELD LAND USE FROM RB-57 PHOTOGRAPHY: THE BOSTON AND NEW HAVEN AREAS Final Report
Robert B. Simpson, Robert S. Yuill, and David T. Lindgren Jun. 1972 87 p refs
(NASA Order W-13318; Contract DI-14-08-0001-12958)
(NASA-CR-137064; USGS-IR-NASA-252; PB-225116/3GA; USGS-DO-73-015) Avail: NTIS HC $6.50 CSCL 08F

Comparison of information from aerial photography with concurrently derived U.S. Census information for the New Haven area is a follow-on to a prototype effort in the Boston area. Using computer techniques developed in the earlier study, a land use map was created supplemented by tabular printouts of statistical data per land use category. The combined experience suggests that interpretation of photography directly into machine readable form would be desirable and comparison of repetitive coverage would permit meaningful charge detection of urban land use. GRA

N74-18068# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

THE REMOTE IDENTIFICATION OF TERRAIN FEATURES AND MATERIALS AT KANSAS TEST SITES: AN INVESTIGATIVE STUDY OF TECHNIQUES Interim Report, 1970-1972
Thomas W. Wagner and Philip G. Hasell, Jr. Jun. 1973 55 p refs
(Contract DOT-FH-11-7136)
(PB-224962/1GA; ERIM-196200-1-T) Avail: NTIS HC $4.75 CSCL 08M

The report documents the collection, processing, and analysis of multispectral data gathered in airborne flights over three test sites in northeastern Kansas during the early spring of 1970. The overall objective for this investigation, as well as for others covered by the same contract, is to develop techniques for automatically identifying, in remotely sensed multispectral imagery, selected terrain features and natural materials. Specific objectives of the studies reported were to: (1) classify automatically soils of different textures or parent materials based on their spectral reflectance characteristics, (2) detect a subsurface cavity in a suburban area of Kansas City, and (3) attempt to evaluate the condition of concrete pavement and bridge decks along a section of Interstate 35. The first objective was achieved during the period covered by this report; the other two were not. (Modified author abstract) (GRA)

N74-18069# Washington Univ., Seattle. Div. of Marine Resources.
ARCTIC ICE DYNAMICS JOINT EXPERIMENT. AIDJEX BULLETIN NO. 22, AUGUST 1973. ARCTIC DATA BUOYS
Pat Martin and Alma Johnson Aug. 1973 140 p refs
(Contract NSF C-625)
(PB-224513/2GA; AIDJEX-Bull-22; AIDJEX-73-22) Avail: NTIS HC $4.50 CSCL 04B

Some of the progress made in arctic data buoy technology in both the U.S. and the U.S.S.R. in recent years is discussed. Contributions include a history of the Soviet DARMS program and its results to date; a discussion of the SHRAMS and LORAMS data telemetry systems developed by Delco Electronics and results of their deployment in the Arctic; an article on the use of the Navy Navigation Satellite System for determining the position of a drifting buoy; a discussion of the Arctic Data Buoy developed by the National Data Buoy Office of NOAA and some results of its deployment in the Arctic; and two papers on barometric pressure measurements from data buoys. GRA

N74-18070# Singmaster and Breyer, New York.
AIR POLLUTION CONTROL IN THE PRIMARY ALUMINUM INDUSTRY. VOLUME 1: SECTIONS 1 THROUGH 10
23 Jul. 1973 324 p 2 Vol.
(Contract AP-70-21)
(PB-224282/4GA; EPA-450/3-73-004a-Vol-1) Avail: NTIS HC $7.00 CSCL 13B

A study was made of the technical and economic aspects of the emissions and control of air pollutants in the primary aluminum industry. The cost and performance data base for the study included detailed information supplied by the domestic producers, typical performance data obtained from equipment suppliers, and published information from the technical literature. Engineering analysis of the data resulted in systems evaluation of current industry control in terms of present costs and performance. Systems analysis was applied to growth projections at various control levels to estimate future costs and emissions. Recommendations were made covering the direction of research and development efforts towards improvement in pollution abatement by the industry. (Modified author abstract) GRA

N74-18071# Singmaster and Breyer, New York.
AIR POLLUTION CONTROL IN THE PRIMARY ALUMINUM INDUSTRY. VOLUME 2: APPENDICES
23 Jul. 1973 264 p 2 Vol.
(Contract AP-70-21)
(PB-224283/2GA; EPA-450/3-73-004b-Vol-2) Avail: NTIS HC $5.75 CSCL 13B

Contents: Data Acquisition Questionnaire; Particle Size Weight Distribution; Fractional Removal Efficiency Curves; Sampling and Analytical Techniques; Determination of Total Fluoride Emissions; EPA Source Sampling; Emission Flow Diagrams; Removal Equipment Purchase Costs; and Sample Calculation of Industry Control Improvement Costs. GRA

N74-18072# Earth Satellite Corp., Washington, D.C.
EVALUATION OF ECONOMIC, ENVIRONMENTAL AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCE SURVEY SATELLITE SYSTEMS Quarterly Progress Report, Feb. - Apr. 1973
14 May 1973 234 p
(Contract DI-14-08-0001-13519)
(PB-224673/4GA; USGS-DO-73-010; QPR-1) Avail: NTIS HC $13.75 CSCL 08F

Initial effort to analyze the economic, environmental, and social costs and benefits of future earth resource survey satellite systems has been to identify user requirements through a review of previous studies, identify earth resources survey information of value to application areas through a review of all ERTS-1 experiment information, to identify and describe user decisions and actions which are or might be influenced by earth resources survey data, particularly in the fields of agriculture and water resources, and to develop recommendations of case studies to be used later. GRA

N74-18073# Woods Hole Oceanographic Institution, Mass.
REVIEW OF THE RESULTS FROM THE EASTERN ATLANTIC CONTINENTAL MARGIN PROGRAM OF THE INTERNATIONAL DECADE OF OCEAN EXPLORATION
K. O. Emery Oct. 1973 34 p refs
(Grant NSF GX-28193)
(PB-225036/3GA; WHOI-73-75; WHOI-Contrib-3218) Avail: NTIS HC $3.75 CSCL 08J

One of the programs of the International Decade of Ocean Exploration is a large geophysical and geological study of the eatern Atlantic continental margin. Excellent results were obtained aboard ship with a computerized system of gravity, magnetics, and seismic reflection and refraction. The cruises mapped large sediment filled basins and belts of salt diapiric structures. Some of the basins and diapirs are the sites of present petroleum production. In addition, small pagoda structures discovered on the deep ocean floor may have some promise as sources for gas. Lastly, areas of coastal upwelling, large river discharge, and open-ocean divergence were outlined as areas being exploited for fish. Author (GRA)

N74-18074# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
GEOLOGIC RECONNAISSANCE AND LITHOLOGIC IDENTIFICATION BY REMOTE SENSING Final Report, 5 May 1972 - 30 Apr. 1973
Robert Vincent, Thomas W. Wagner, Ben Drake, and Phillip Jackson Dec. 1973 119 p refs
(Contract DI-BM-HO-220064; ARPA Order 1579)
(AD-771278; ERIM-191700-8-F) Avail: NTIS CSCL 08/7

The role of remote sensing in geologic reconnaissance for purposes of tunnel site selection was studied further and a test case was undertaken to evaluate this geological application. Airborne multispectral scanning (MSS) data were obtained in May, 1972, over a region between Spearfish and Rapid City, South Dakota. With major effort directed toward the analysis of these data, the following geologic features were discriminated: (1) exposed rock areas, (2) five separate rock groups, (3) large-scale structures. This discrimination was accomplished by ratioing multispectral channels. Laboratory-type remote sensing data are shown to permit geologic interpretation. These technological advances are the first steps toward airborne lithologic identification. The method has the potential for still finer discrimination and, hence, application to more rock types. Author (GRA)

N74-18075# Naval Research Lab., Washington, D.C.
MICROWAVE PROPERTIES OF A CALM SEA
James P. Hollinger 15 Aug. 1973 72 p refs
(AD-771374; NRL-7110-2) Avail: NTIS CSCL 08/10

The report presents calculations of the following: The dielectric properties of water as a function of the salinity and temperature of the water and the frequency of observation; the propagation characteristics of microwave radiation in water for these dielectric properties as a function of salinity, temperature, and frequency; and the brightness temperature of a calm sea,

based on these dielectric properties, as a function of salinity and temperature of the water and the frequency, polarization, and angle of incidence of observation. GRA

N74-18076# Scripps Institution of Oceanography, La Jolla, Calif.
MONTHLY MEAN SEA SURFACE TEMPERATURE DEPARTURES OVER THE NORTH PACIFIC OCEAN WITH CORRESPONDING SUBSURFACE TEMPERATURE DEPARTURES AT OCEAN WEATHER STATIONS VICTOR, PAPA, AND NOVEMBER FROM 1950 TO 1970
R. Born, A. Walker, J. Namis, and W. White 31 Oct. 1973 250 p refs
(Contract N00014-69-A-0200-6043)
(AD-771457; SIO-Ref-73-28) Avail: NTIS CSCL 08/10

The report presents monthly mean sea surface temperature departures from a 20-year mean (1947 -1966) over the North Pacific Ocean from 1950 to 1970. In addition, bathythermograph data taken at Ocean Weather Stations VICTOR (35 degrees N, 165 degrees E), PAPA (50 degrees N, 145 degrees W) and NOVEMBER (30 degrees N, 140 degrees W) are presented as monthly and long-term means for the months and years available from 1950 to 1970. Author (GRA)

N74-18077# Scripps Institution of Oceanography, La Jolla, Calif.
A MULTI-LAYER, NONLINEAR REGIONAL DYNAMIC MODEL OF THE NORTH PACIFIC OCEAN
Joseph Chi Kan Huang 10 Sep. 1973 52 p refs
(Contract N00014-69-A-0200-6043)
(AD-771305; SIO-Ref-73-23) Avail: NTIS CSCL 08/3

A time dependent, three-dimensional numerical dynamic model of the North Pacific Ocean, possessing an actual coastal configuration and seven layers, has been developed at the Scripps Institution of Oceanography in order to show the physical nature of the large-scale normal and abnormal characteristics of the ocean in response to the various normal and anomalous seasonal meteorological conditions. Author (GRA)

N74-18078# Environmental Prediction Research Facility (Navy), Monterey, Calif.
COASTAL SEA-AIR INTERACTIONS AND THE EXTENT OF COASTAL INFLUENCE Progress Report
T. Laevastu Nov. 1973 34 p refs
(AD-772093; ENVPREDRSCHFAC-Tech-Note-8; PR-2) Avail: NTIS CSCL 04/2

The objectives of this project are (1) to determine the extent of coastal influence in various meteorological conditions including the determination of the speed of response to the properties of surface air to the properties of the sea surface; (2) to determine the effect of the feedback of energy from the oceans on the atmosphere and describe and quantitatively formulate the mesoscale processes on the atmosphere in coastal regions; and (3) to determine how to use coastal meteorological and oceanographic observations for the analysis and prediction of coastal weather and the extent of oceanic conditions and anomalies offshore through the projection of coastal observations to offshore areas. (Modified author abstract) GRA

N74-18079# Stanford Research Inst., Menlo Park, Calif.
SCATTERING OF LASER RADIATION FROM THE OCEAN SURFACE Technical Report, 23 Apr. - 31 Aug. 1973
Kamala S. Krishnan and Norman A. Peppers Oct. 1973 104 p refs
(Contract N00014-73-C-0445; ARPA Order 2185)
(AD-772122) Avail: NTIS CSCL 20/6

The theory of speckle patterns from diffusely scattered coherent light was examined and extended to apply to scattering by the surface of the sea. It was determined that the surface characteristics can be related to the ensemble average power spectral density of the scattered radiation. However, since measurement of the latter quantity is difficult, it would be more practical to measure the ensemble average scattered intensity distribution. It turns out that the expression obtained for that distribution is similar to that for high frequency radar backscatter. GRA

N74-18080# Michigan Univ., Ann Arbor. Coll. of Engineering.
AN INVESTIGATION OF THE STRUCTURE OF TURBULENCE OVER WATER SURFACE WAVES Final Summary Report, 1967 - 1973
Donald J. Portman and Kenneth L. Davidson Nov. 1973 28 p refs
(Contract N00014-67-A-0181-0005; NR Proj. 083-224)
(AD-771471) Avail: NTIS CSCL 04/2

Wind velocity components and air temperature fluctuations were measured within a few meters above lake and ocean waves to study the influence of waves on the three-dimensional structure of turbulence and the vertical fluxes of momentum and sensible heat. Analyses were made primarily in terms of variances, covariances, spectrum and cross-spectrum functions and joint probability distribution functions of the measured variables. The report summarizes the methods of measurement and data processing used and gives fourteen abstracts of reports, theses and papers resulting from the investigation. It lists, also, twenty periods of measurement, made during BOMEX, data from which are to be placed in the BOMEX Permanent Archive. Author (GRA)

N74-18081# Missouri Univ., Kansas City. Dept. of Physics.
INFRARED REFLECTANCE MEASUREMENTS OF MISSOURI WATERS FOR WATER QUALITY APPLICATIONS Completion Report, 1 Jun. 1972 - 30 Jun. 1973
Richard C. Waring and Marvin R. Querry Aug. 1973 88 p refs
(Contract DI-14-31-0001-3825)
(PB-225420/9GA; OWRR-A-063-Mo(1)) Avail: NTIS HC $3.75 CSCL 13B

The desirability of routinely measuring the quality of natural waters has increased with increasing sources of industrial and domestic pollutants. Clearly it would be advantageous to monitor water quality remotely; thus avoiding the time consuming and limited usefullness of hand sampling. Before water quality measurements can be made from data collected remotely from infrared systems the characteristic manner in which solutes in water reflect electromagnetic radiation must be known. In this research project the authors have determined the characteristic way in which some solutes and oil reflect infrared radiation. The research is a part of a larger goal to monitor water quality remotely. GRA

N74-18082# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPORADIC FORMATIONS OF A NOCTURNAL AURORAL IONOSPHERE. SEVERAL METHODS FOR DETERMINING THE PROFILE OF ELECTRON CONCENTRATION BY GROUND-BASED MEANS
N. K. Osipov and N. B. Pivovarova 28 Nov. 1973 7 p Transl. into ENGLISH from the publ. "Magneto-Ionospheric Disturbances and Aurural Electrons" USSR, 1973 p 43-44
(AD-772010; FTD-HT-23-436-74) Avail: NTIS CSCL 04/1

The basic method for studying the electron concentration at altitudes of 90-150 km is the vertical radiosonding of the atmosphere with the use of an automatic ionospheric station. GRA

N74-18083# Radio Corp. of America, Burlington, Mass.
HOLOGRAPHIC MULTICOLOR MOVING MAP DISPLAY (SYSTEM DEFINITION) Final Report
Gardner T. Burton, Burton R. Clay, Richard F. Croce, Douglas A. Gore, Louis A. Perretta, B. W. Siryl, and R. C. Blanchard Sep. 1973 135 p
(Contract N62269-72-C-0452)
(AD-772155) Avail: NTIS CSCL 09/5

The report describes the work performed during a 12-month program designed to extend the performance characteristics of a holographic moving map display concept to enhance its performance characteristics in a cockpit environment. Features were added to the basic display concept to allow use of the moving map concept as a horizontal situation display. Techniques were presented for adding dynamic symbology features to the display for preflight annotating of the displayed data, and for presenting IR, FLIR and LLTV information through the same viewing aperture as the map data. A new transport system was defined to access the stored data rapidly. Author (GRA)

N74-18084# Stanford Research Inst., Menlo Park, Calif.
INSTITUTE FOR TELECOMMUNICATION SCIENCES (ITS) IONOSPHERIC MEASUREMENTS PROGRAMS
C. K. Hinrichs Jun. 1973 22 p refs
(Contract DNA001-72-C-0143; DNA Proj. NWET-L25AAXY)
(AD-772055; SRI-EGU-TN-1928-A9; DNA-3193T) Avail: NTIS CSCL 04/1

The report is one of a series that provides brief descriptions of scientific programs investigating the physics and chemistry of the upper atmosphere under normal and disturbed conditions in support of the High Altitude Effects Simulation (HAES) program of the Defense Nuclear Agency (DNA). In the absence of actual nuclear testing in the atmosphere a number of experiments are being carried out both in the laboratory and in the field to determine a sufficient number of parameters to characterize the environment and its reactions in a suitable model. Several agencies in addition to those in the Department of Defense support research concerned with the upper atmosphere and ionosphere. One of these is the Institute for Telecommunications Sciences ((ITS). The report briefly describes two programs conducted by ITS with DNA support that measure the electron density in the lower ionosphere, and are therefore directly related to the HAES program. (Modified author abstract) GRA

N74-18085# Army Foreign Science and Technology Center, Charlottesville, Va.
SOME PROPERTIES OF THE ATMOSPHERIC AEROSOL
T. P. Toropova 29 Aug. 1973 14 p refs Transl. into ENGLISH from unidentified Russian language article
(AD-771082; FSTC-HT-23-408-72) Avail: NTIS CSCL 04/1

Properties of atmospheric aerosol are discussed, based on measurements of sky brightness and atmospheric transparency. Available data was investigated and theoretical calculations were made. (Modified author abstract) GRA

N74-18086# American Committee for the Weizmann Inst. of Science, Inc., New York.
TIDES IN THE OCEAN Final Report, 1 Oct. 1965 - 30 Sep. 1973
C. L. Perkeris 16 Dec. 1973 18 p refs
(Contract N00014-66-C-0080; NR Proj. 083-780)
(AD-771433) Avail: NTIS CSCL 08/3

Contents: Solution of Laplace's equations for the M2 tide in the world oceans; Effect of the liquid core of the earth on the bodily tide; The Dynamo Theory of the origin of the earth's magnetic field. GRA

N74-18087# Bradford Computer and Systems, Inc., New York.
CONRAD: A PROGRAM TO CONTOUR RADAR DATA Final Technical Report
Bernard Fleshel Dec. 1973 69 p
(Contract DAAK02-73-C-0385)
(AD-771994; ETL-CR-73-20) Avail: NTIS CSCL 08/2

A contour generating system (CONRAD) is described whose input is either a UNAMACE created magnetic tape or radar altitude data. CONRAD is a modified version of CONPLOT 2 for a UNIVAC 1108 - EXEC 8 computer. Output of this system is a large cartographic quality contour map which can be combined to form still larger maps. This contour map includes: (a) Universal Transverse Mercator Grid; (b) variable contour levels; (c) multiple labelled and broadened index contours; (d) depression indications; and (e) a variable output plotting scale. The following data handling techniques are used: (a) parallel processing; (b) random access; (c) binary searching; and (d) binary sorting. The internal processing of the input data includes: (a) redundant data elimination; (b) noise elimination and data smoothing by either an Area Smoothing Algorithm or a Least Squares Smoothing Algorithm; (c) automatic mosaicking of multiple models into a single large plotted map; and (d) dynamic allocation of drum storage. Author (GRA)

N74-18257 Joint Publications Research Service, Arlington, Va.
ON CERTAIN STRUCTURAL PECULIARITIES IN THE QUASI-BIENNIAL CYCLE IN THE EQUATORIAL STRATOSPHERE
O. N. Belinskiy and G. S. Buldovskiy *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 49-60 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 38-45 (For availability see N74-18252 09-20)

N74-18258 Joint Publications Research Service, Arlington, Va.
THE NATURE OF THE CIRCULATION IN THE EQUATORIAL STRATOSPHERE WITH PREVAILING WESTERLIES AND EASTERLIES
L. G. Nemirovskaya *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 61-72 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 46-53 (For availability see N74-18252 09-20)

N74-18260 Joint Publications Research Service, Arlington, Va.
A TWO-LAYER MODEL FOR COMPUTING THE THICKNESS OF AN ISOTHERMIC LAYER IN THE OCEAN
V. I. Kalatskiy *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Jul. 1974 p 82-93 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 60-68 (For availability see N74-18252 09-20)

N74-18262 Joint Publications Research Service, Arlington, Va.
COMPUTER CALCULATION OF THE HYDROLOGICAL REGIME OF SOIL AS A METHOD OF APPLYING THE RESULTS OF LYSIMETER OBSERVATIONS TO FIELD CONDITIONS
V. P. Yemets, L. L. Zhuravleva, V. Ya. Kulik, and N. V. Pichugina *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Jul. 1974 p 104-108 Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 77-80 (For availability see N74-18252 09-20)

N74-18264 Joint Publications Research Service, Arlington, Va.
STRATOSPHERIC WARMING IN JANUARY - FEBRUARY 1973
I. V. Bugayeva, L. A. Ryazanova, and D. A. Tarasenko *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 122-128 ref Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 90-93 (For availability see N74-18252 09-20)

N74-18267 Joint Publications Research Service, Arlington, Va.
ON THE POWER OF THE EFFECT OF CORPUSCULAR RADIATION FLUXES ON CIRCULATION CONDITIONS IN THE LOWER LAYERS OF THE ATMOSPHERE
I. V. But *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 139-148 refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 99-103 (For availability see N74-18252 09-20)

N74-18268 Joint Publications Research Service, Arlington, Va.
REPLIES TO ARTICLE ON THE POWER OF THE EFFECT OF CORPUSCULAR RADIATION FLUXES ON CIRCULATION CONDITIONS IN THE LOWER LAYERS OF THE ATMOSPHERE
E. R. Mustel, B. I. Sazonov, and V. F. Loginov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 149-152 Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 104-105 (For availability see N74-18252 09-20)

N74-18270 Joint Publications Research Service, Arlington, Va.
USE OF SNOW SURVEY PROCEDURES DEBATED
I. Ya. Liser and I. D. Kopanov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 155-157 Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 107 (For availability see N74-18252 09-20)

N74-18271 Joint Publications Research Service, Arlington, Va.
THE SYSTEM OF OBSERVATIONS FOR THE FIRST WORLDWIDE GARP EXPERIMENT
V. P. Meleshko *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 158-169 refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 108-114 (For availability see N74-18252 09-20)

N74-18447* Texas Univ., Dallas.
LUNAR ATMOSPHERIC COMPOSITION EXPERIMENT
J. H. Hoffman, R. R. Hodges, Jr., F. S. Johnson, and D. E. Evans (NASA. Johnson Space Center) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept., 1973 9 p refs

(For availability see N74-18428 09-30)
CSCL 04A

N74-18456* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INFRARED SCANNING RADIOMETER
F. J. Low (Ariz. Univ.) and W. W. Mendell *In its* Apollo 17 Prelim. Sci. Rept. 1973 6 p refs (For availability see N74-18428 09-30)
CSCL 04A

N74-18573 Joint Publications Research Service, Arlington, Va.
STUDY OF THE DYNAMICS OF AEROSOLS
B. V. Deryagin *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 48-57 Transl. into ENGLISH of Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 38-44 (For availability see N74-18567 09-34)

N74-18574 Joint Publications Research Service, Arlington, Va.
MODERN AERONOMICAL PROBLEMS
A. D. Danilov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 59-68 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 45-51 (For availability see N74-18567 09-34)

N74-18575 Joint Publications Research Service, Arlington, Va.
WINDS AND DRIFTS IN THE IONOSPHERE
E. S. Kazimirovskiy *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 69-81 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 52-62 (For availability see N74-18567 09-34)

N74-18576 Joint Publications Research Service, Arlington, Va.
METASTABLE IONOSPHERIC PARTICLES
M. N. Vlasov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 83-91 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, 1973 p 63-69 (For availability see N74-18567 09-34)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-18088* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH FIELD CdS DETECTOR FOR INFRARED RADIATION Patent
Ramesh C. Tyagi (NAS-NRC), James B. Robertson, Karl W. Boer (Univ. of Delaware), and Henry C. Hadley, Jr., inventors (to NASA) (Univ. of Delaware) Issued 5 Feb. 1974 4 p Filed 26 Jul. 1972 Supersedes N72-28463 (10 - 19, p 2564)
(NASA-Case-LAR-11027-1; US-Patent-3,790,795; US-Patent-Appl-SN-275118; US-Patent-Class-250-338; US-Patent-Class-250-370; US-Patent-Class-250-371) Avail: US Patent Office CSCL 14B

An infrared radiation detector including a cadmium sulfide platelet having a cathode formed on one of its ends and an anode formed on its other end is presented. The platelet is suitably doped such that stationary high-field domains are formed adjacent the cathode when based in the negative differential conductivity region. A negative potential is applied to the cathode such that a high-field domain is formed adjacent to the cathode. A potential measuring probe is located between the cathode and the anode at the edge of the high-field domain and means are provided for measuring the potential at the probe whereby this measurement is indicative of the infrared radiation striking the platelet. Official Gazette of the U.S. Patent Office

N74-18089* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
METHOD OF FABRICATING AN ARTICLE WITH CAVITIES Patent
Walter J. Dale and George M. Jurscaga, inventors (to NASA) Issued 19 Feb. 1974 5 p Filed 8 Feb. 1972 Supersedes N72-20396 (10 - 11, p 1473)
(NASA-Case-LAR-10318-1; US-Patent-3,793,109; US-Patent-Appl-SN-224489; US-Patent-Class-156-245; US-Patent-Class-156-285; US-Patent-Class-156-309; US-Patent-Class-156-247) Avail: US Patent Office CSCL 14B

An article having a cavity with a thin bottom wall is provided by assembling a thin sheet, for example, a metal sheet, adjacent to the surface of a member having one or more apertures. A bonding adhesive is interposed between the thin sheet and the subadjacent member, and the thin sheet is subjected to a high fluid pressure. In order to prevent the differential pressure from being exerted against the thin sheet, the aperture is filled with a plug of solid material having a linear coefficient of thermal expansion higher than that of the member. When the assembly is subjected to pressure, the material is heated to a temperature such that its expansion exerts a pressure against the thin sheet thus reducing the differential pressure.
Official Gazette of the U.S. Patent Office

N74-18090* National Aeronautics and Space Administration. Pasadena Office, Calif.
INVERTER RATIO FAILURE DETECTOR Patent
Albert P. Wagner (GE, Philadelphia), Theodore J. Ebersole (GE, Philadelphia), and Robert E. Andrews, inventors (to NASA) (GE, Philadelphia) Issued 5 Mar. 1974 10 p Filed 10 May 1973 Supersedes N73-23525 (11 - 14, p 1667) Sponsored by NASA
(NASA-Case-NPO-13160-1; US-Patent-3,795,858; US-Patent-Appl-SN-359157; US-Patent-Class-324-57R; US-Patent-Class-321-8R) Avail: US Patent Office CSCL 14B

A failure detector which detects the failure of a dc to ac inverter is disclosed. The inverter under failureless conditions is characterized by a known linear relationship of its input and output voltages and by a known linear relationship of its input and output currents. The detector includes circuitry which is responsive to the detector's input and output voltages and which provides a failure-indicating signal only when the monitored output voltage is less by a selected factor, than the expected output voltage for the monitored input voltage, based on the known voltages' relationship. Similarly, the detector includes circuitry which is responsive to the input and output currents and provides a failure-indicating signal only when the input current exceeds by a selected factor the expected input current for the monitored output current based on the known currents' relationship. Official Gazette of the U.S. Patent Office

N74-18091*# IIT Research Inst., Chicago, Ill.
DEVELOPMENT OF A POSITION SENSITIVE X-RAY DETECTOR FOR USE IN A LIGHT WEIGHT X-RAY DIFFRACTOMETER Final Report, 17 Aug. - 17 Jun. 1973
Richard A. Semmler Oct. 1973 26 p refs
(Contract NASw-2382)
(NASA-CR-137078; IITRI-V6133-3) Avail: NTIS HC $4.50 CSCL 14B

The characteristics of a curved position sensitive X-ray detector are discussed. Emphasis is placed on the analysis of operation in a focusing diffraction geometry. Problems encountered in constructing the sensor are described. Construction drawings of the sensor components are provided. Author

N74-18092*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
ALSEP ARRAYS A, B, C, AND A-2 Final Report
Sep. 1973 218 p
(Contract NAS9-5829)
(NASA-CR-134202; BSR-4096) Avail: NTIS HC $14.00 CSCL 14B

The objectives of the lunar surface exploration packages are defined and the preliminary design of scientific systems hardware is reported. Instrument packages are to collect and transmit to earth scientific data on the lunar interior, the lunar surface composition, and the lunar geomorphology G.G.

N74-18093*# National Aeronautics and Space Administration. Pasadena Office, Calif.
WIDE ANGLE SUN SENSOR Patent Application
Larry L. Schumacher, inventor (to NASA) (JPL) Filed 28 Dec. 1973 18 p
(Contract NAS7-100)
(NASA-Case-NPO-13327-1; US-Patent-Appl-SN-429437) Avail: NTIS HC $4.00 CSCL 14B

A single-axis sun sensor consists of a cylinder of an insulating material on which at least one pair of detectors is deposited on the cylinder circumference. At any time, only one-half of the cylinder is illuminated so that the total resistance of the two detectors is a constant. Due to the round surface on which the detectors are deposited, the sensor exhibits a linear wide angle of + or - 50 deg to within an accuracy of about 2 percent. By depositing several pairs of detectors on adjacent circumferences, sufficient redundancy is realized to provide high reliability. A two-axis sensor is provided by depositing detectors on the surface of a sphere along at least two orthogonal great circles. NASA

N74-18094*# Illinois Univ., Urbana. Dept. of Civil Engineering.
TREATMENT OF CONTROL DATA IN LUNAR PHOTOTRIANGULATION Final Technical Report
K. W. Wong Jan. 1974 68 p refs
(Contract NAS9-12446)
(NASA-CR-134195; UILU-ENG-74-2001) Avail: NTIS HC $6.50 CSCL 14E

In lunar phototriangulation, there is a complete lack of accurate ground control points. The accuracy analysis of the results of lunar phototriangulation must, therefore, be completely dependent on statistical procedure. It was the objective of this investigation to examine the validity of the commonly used statistical procedures, and to develop both mathematical techniques and computer softwares for evaluating (1) the accuracy of lunar phototriangulation; (2) the contribution of the different types of photo support data on the accuracy of lunar phototriangulation; (3) accuracy of absolute orientation as a function of the accuracy and distribution of both the ground and model points; and (4) the relative slope accuracy between any triangulated pass points. Author

N74-18095*# National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
A RADIATION MODEL FOR CALCULATING ATMOSPHERIC CORRECTIONS TO REMOTELY SENSED INFRARED MEASUREMENTS, VERSION 2
Robert D. Boudreau Sep. 1973 111 p refs
(NASA-TM-X-69939; ERL-053) Avail: NTIS HC $8.75 CSCL 14B

A numerical model is developed which calculates the atmospheric corrections to infrared radiometric measurements due to absorption and emission by water vapor, carbon dioxide, and ozone. The corrections due to aerosols are not accounted for. The transmissions functions for water vapor, carbon dioxide, and water are given. The model requires as input the vertical distribution of temperature and water vapor as determined by a standard radiosonde. The vertical distribution of carbon dioxide is assumed to be constant. The vertical distribution of ozone is an average of observed values. The model also requires as input the spectral response function of the radiometer and the nadir angle at which the measurements were made. A listing of the FORTRAN program is given with details for its use and examples of input and output listings. Calculations for four model atmospheres are presented. Author

N74-18096*# Bowles Fluidics Corp., Silver Spring, Md.
THE FEASIBILITY OF A FLUIDIC RESPIRATORY FLOW METER Final Report, 27 Sep. 1972 - 11 Jan. 1974
Vincent F. Neradka and Harry C. Bray, Jr. Jan. 1974 44 p refs
(Contract NAS1-11955)
(NASA-CR-132296; R-01-09-74) Avail: NTIS HC $5.25 CSCL 14B

A study was undertaken to determine the feasibility of adapting a fluidic airspeed sensor for use as a respiratory flowmeter. A Pulmonary Function Testing Flowmeter was developed which should prove useful for mass screening applications. The fluidic sensor threshold level was not reduced sufficiently to permit its adaptation to measuring the low respiratory flow rates encountered in many respiratory disorders. Author

N74-18097# Solar, San Diego, Calif.
TURBINE BLADE TEMPERATURE MEASUREMENT SYSTEM: OPERATION MANUAL
David A. Rohy and W. A. Compton Oct. 1973 34 p
(SOLAR-P/N-106751) Avail: NTIS HC $4.75

Turbine blade temperature control is described for engines operating with inlet gas temperatures over 2000 F. A description of the turbine blade temperature measurement system is given in an operator's manual. Calibration procedures, engineering drawings and schematics are included. S.K.W.

N74-18098*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTROSTATIC ENTRAINED MATERIAL MEASUREMENT SYSTEM Patent Application
James E. Johnston, inventor (to NASA) Filed 12 Mar. 1974 12 p
(NASA-Case-MFS-22128-2; US-Patent-Appl-SN-450536) Avail: NTIS HC $4.00 CSCL 14B

A device to measure the quantity of particulate material in air is described, comprising a tube and a vacuum source. The use of an electrostatic sensor in proximity to the tube provides a direct indication of the level of particulate matter. The device is uncomplicated and economical. NASA

N74-18099*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMBINED DUAL SCATTER, LOCAL OSCILLATOR LASER DOPPLER VELOCIMETER Patent Application
Kenneth L. Orloff, inventor (to NASA) Filed 28 Mar. 1974 18 p
(NASA-Case-ARC-10642-1; US-Patent-Appl-SN-446562) Avail: NTIS HC $4.00 CSCL 14B

A laser Doppler velocimeter is described which is capable of effectively measuring two different velocity components of a fluid simultaneously. Such a velocimeter includes a pair of coherent beams of laser light which are focused to an intersection point through which flow particles within the fluid whose velocity is to be measured. Both beams are plane polarized with the plane of polarization of one being rotated normally with respect to the other, with the result that the scattered radiation is separable into two different beams respectively corresponding to the two incident beams. Such scattered radiation is Doppler shifted by the moving particles and is collected for conventionally providing a measurement of the velocity of any particle flowing through the intersection point on a path which is generally transverse. NASA

N74-18100*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS FOR CALIBRATING AN IMAGE DISSECTOR TUBE Patent Application
Edwin E. Klingman, III, inventor (to NASA) Filed 5 Mar. 1974 19 p
(NASA-Case-MFS-22208-1; US-Patent-Appl-SN-448325) Avail: NTIS HC $4.00 CSCL 14B

The photosensitive screen of an image dissector tube is illuminated with a light pattern, having parallel opposite edges. A sweep signal is applied to the deflection coils of the tube, causing pattern scanning in a line perpendicular to the edges and generation of an output video pulse. The sweep signal is in the form of a time variable current whose average rate of change during the scan of the line is a constant and is dependent on a settable control circuit. Measurement of the output pulse width permits the setting of the slope control circuit to be changed if the width differs from a standard associated with the tube. NASA

N74-18101*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW MEASURING APPARATUS Patent Application
Paul R. Prokopius, inventor (to NASA) Filed 28 Feb. 1974 19 p

(NASA-Case-LEW-12078-1; US-Patent-Appl-SN-447124) Avail: NTIS HC $4.00 CSCL 14B

An apparatus for measuring the mass flow rates of the components comprising a binary gas mixture is described. This is accomplished by directing a binary fluid or gas through a fluidic humidity sensor and then through a calorimeter which increases the temperature of the flowing binary gas. Electrical signals provided by the fluidic humidity sensor, the flow calorimeter and a power supply which energizes or heats the calorimeter are operated upon in a predetermined manner to provide an output signal indicative of the mass flow rate of one of the binary gases, thus allowing the mass flow rate of the other gas to be determined since the total mass flow rate is previously calculated by the instrument and is the output of the operating module. NASA

N74-18102# Lockheed Missiles and Space Co., Palo Alto, Calif.

LOW-ENERGY ELECTRON AND PROTON SPECTROMETER ON THE MOLNIIA-1

V. I. Lazarev, B. V. Marin, M. V. Teltsov, and V. V. Shilov 1973 5 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 13, no. 5, 1973 p 807-811

Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The characteristics of a low energy electron and proton spectrometer mounted in the Molniia-1 satellite are discussed. Extraction of particles is accomplished by an electrostatic analyzer and particle detection is made with a channel electron multiplier. Experimental curves of analyzer transmission, obtained by using an electron gun for several electron energies are shown on a graph. A block diagram of the circuits is provided. Results obtained with the equipment during performance tests are reported. Author

N74-18103*# DBA Systems, Inc., Melbourne, Fla.

PHOTOGRAMMETRIC CALIBRATION OF THE NASA-WALLOPS ISLAND IMAGE INTENSIFIER SYSTEM

Bill F. Harp 15 May 1972 73 p refs

(Contract NAS6-2066)

(NASA-CR-137455) Avail: NTIS HC $6.75 CSCL 14B

An image intensifier was designed for use as one of the primary tracking systems for the barium cloud experiment at Wallops Island. Two computer programs, a definitive stellar camara calibration program and a geodetic stellar camara orientation program, were originally developed at Wallops on a GE 625 computer. A mathematical procedure for determining the image intensifier distortions is outlined, and the implementation of the model in the Wallops computer programs is described. The analytical calibration of metric cameras is also discussed. K.M.M.

N74-18104# Commissariat a l'Energie Atomique, Saclay (France).

THE (ALPHA,n) NEUTRON SPECTRA DETERMINATION BY LIQUID SCINTILLATOR SPECTROMETER TECHNIQUE

A. Capgras, C. Ronteix, and M. Sueur Oct. 1973 27 p refs In FRENCH

(CEA-R-4504) Avail: AEC Depository Libraries HC $3.50

An organic liquid scintillator spectrometer, developed for studying (alpha, neutron) sources, is described. A pulse shape discrimination has been used to eliminate gamma effects. The spectra of Am241-Be and Pu 239-Be sources are determined in the energy range 1.5 to 12 MeV. Author (NSA)

N74-18105# Brookhaven National Lab., Upton, N.Y.

DESIGN OF A COAXIAL TE SUB 011 CAVITY FOR MEASUREMENTS OF METALLURGICAL PROPERTIES AND SUPERCONDUCTING rf BREAKDOWN FIELDS ON THE SAME SAMPLE

W. Bauer, S. Giordano, and T. Luhman 26 Jun. 1973 15 p refs Sponsored by AEC

(BNL-18186) Avail: NTIS HC $3.00

A TE sub 011 coaxial cavity is described, where the center conductor is designed as a removable sample. The samples can be used for measurements of rf breakdown fields as well as metallurgical properties. Some of the proposed investigations are outlined. Author (NSA)

N74-18106# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics.

Q METER WITH AUTOMATIC FINE ADJUSTMENT OF THE INPUT CIRCUIT

M. N. Drazhev and A. I. Ivanenko 1973 11 p refs In RUSSIAN

(JINR-P13-7176) Avail: AEC Depository Libraries HC $3.00

A transistorized Q meter for measurement of the polarization in proton targets is described. By means of the phase-sensitive detector, fine adjustment of the input sequential circuit is effected which makes possible very exact measurements of the polarization magnitude. Author (NSA)

N74-18107# Rome Univ. (Italy). Inst. of Physics.

PLASTIC CHAMBERS

M. Conversi, L. Federici, and Q. Taccetti 28 May 1973 21 p ref Presented at the Intern. Conf. on Instrumentation for High Energy Phys., Frascati, Italy, 8-12 May 1973

(Nota-Interna-467) Avail: NTIS HC $3.25

An electrically pulsed track chamber, composed of sensitive elements of plastic material in which a noble gas mixture flows, is described. General features of the chamber include: (1) ease in realizing large sensitive volumes of any geometrical shape, (2) very low cost of construction and operation, (3) high efficiency in detecting multitrack events, and (4) possibility of recording the information either optically by television systems or electrically by simple probes which yield pulses that need no amplification. Two particular versions of plastic chamber are described. One of them, made of honeycomb structured polypropylene, is characterized by lack of dead space, minimum amount of low Z insensitive materials, space resolution in the mm region, and time resolution which can be adjusted from approximately 0.1 to approximately 10 microns per element by varying the rate of gas flow through the sensitive elements. At the preliminary stage of the investigation only recovery times greater than or approximately 50 ms were obtained. Author (ESRO)

N74-18108# Explosives Research and Development Establishment, Waltham Abbey (England).

A FORCED VIBRATION METHOD FOR THE MEASUREMENT OF DYNAMIC-MECHANICAL PROPERTIES OF MATERIALS

B. L. Hammant Feb. 1973 31 p refs

(ERDE-TR-130; BR37459) Avail: NTIS HC $4.75

Signals generated by a digital transfer-function analyzer drive torque motors which impart sinusoidally varying stress to flexural and torsional test systems. The resulting deformation was measured by angular transducers and displayed by the function-analyzer as displacement amplitude and phase shift with respect to the applied stress signal. The system was analyzed and a method for calculating the complex modulus and loss tangent of the specimen was developed. Typical results for polycarbonate and glass-reinforced polycarbonate are discusssed, and some advantages of the method are indicated. Author (ESRO)

N74-18109# Rocket Propulsion Establishment, Westcott (England).

A QUADRUPOLE MASS FILTER FOR MOLECULAR BEAM DETECTION

R. G. Wilkins Jul. 1972 47 p refs

(RPE-TR-72/5; BR36358) Avail: NTIS HC $5.50

The theory of a quadrupole mass filter is outlined and the design and construction of an instrument built at the RPE to analyze, in conjunction with a molecular beam sampling system, the composition of low pressure flames is described. Ancillary equipment is also described and results are presented to show the resolution, sensitivity and stability of the instrument. ESRO

N74-18110# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

DIMENSIONING AND ADJUSTING OF LASER ANEMOMETERS WHEN USING WOLLASTON PRISMS AS BEAM SPLITTERS [DIMENSIONIERUNG UND JUSTIERUNG VON LASERANEMOMETERN BEI DER VERWENDUNG VON WOLLASTON-PRISMEN ALS STRAHLTEILER]

W. J. Hiller and G. E. A. Meier Sep. 1973 19 p refs In GERMAN

(Rept-12/1973) Avail: NTIS HC $4.00; Max-Planck-Inst. fuer

Stroemungs-forsch., Goettingen, West Ger. 6,50 DM

Laser anemometers operating with the crossing beam technique give reliable measurement values only when the crossing area i.e. the measuring volume, of the two laser beams include their focuses. Relationships are given which enable correct adjustments of a laser anemometer at given measuring volume and number of interference lines. ESRO

N74-18111# Picatinny Arsenal, Dover, N.J.
THE 3D RADIOGRAPH DISPLAY BY MEANS OF HOLOGRAPHY
Paul J. Kisatsky and Modesto Barbarisi Nov. 1973 23 p refs
(AD-769641; PA-TR-4524) Avail: NTIS CSCL 14/2

Although direct X-ray holography is not technically feasible it is possible to create such displays by the proper application of optical holography to previously radiographed items. Several items were X-rayed from different perspective angles and the radiographs were then multiplexed onto one hologram plate. Results yield good three dimensional X-ray views of the object. Exaggerated perspective such as seeing 180 degrees view of the item with a 90 degrees motion of the observer is also possible. An interesting fringe benefit is the storage of large numbers of 12x16 inch radiographs onto a small 4x5 holographic plate resulting in a storage density improvement of at least 100. Author (GRA)

N74-18112# Army Foreign Science and Technology Center, Charlottesville, Va.
APPARATUS FOR MEASURING GALVANO AND THERMOMAGNETIC EFFECTS ON LOW TEMPERATURE THERMOELECTRIC MATERIALS
V. A. Kulikov and Yu. N. Saraev 9 Nov. 1973 12 p refs
Transl. into ENGLISH from Nauchn. Tr., Politekhn. Inst. (Irkutsk), no. 52, 1968 p 58-69
(AD-771011; FSTC-HT-23-1862-72) Avail: NTIS CSCL 14/2

To cut the time required for an absolute stationary method of taking temperature and field characteristics of a material, an apparatus has been designed permitting measurement of galvano- and thermomagnetic effects on seven samples simultaneously in the range from 78 - 300K in a field of 10 - 10,000 gauss, and direct determination by the Harman method of thermal efficiency. Glass and metal holders were used. (Modified author abstract) GRA

N74-18113# Pennsylvania State Univ., University Park. Materials Research Lab.
QUANTITATIVE SEM AND RASTER PROFILOMETER ANALYSIS OF FRACTURE SURFACES
J. M. Samuels, M. R. Hoover, Jr., L. Tarhay, G. G. Johnson, Jr., and H. A. McKinstry 7 Dec. 1973 13 p refs
(Contract N00014-67-A-0385-0019)
(AD-771478; TR-1) Avail: NTIS CSCL 14/2

The problem of being able to obtain raster profilometer traces and SEM image recording from identical fracture areas has been solved. Both types of image are now being processed by the same CESEMI computer programs for purposes of mapping of data and for quantitative enumeration of surface characteristics. The raster profilometer data tend to measure the actual long-range surface elevational detail, while the SEM images tend to bring out details of short-range surface roughness. It appears to be feasible, in the long run, to obtain SEM data comparable to raster profilometer, but this will definitely involve the use of multiple detector arrangements at the least. The derivative-signal processed images are particularly useful in viewing fracture surface detail, and it is anticipated that considerable use will be made of this kind of image detail in the future. Author (GRA)

N74-18114# Highway Research Board, Washington, D.C.
PHOTOGRAMMETRIC ANALYSIS OF URBAN AND RURAL ENVIRONMENTS
1973 71 p refs Presented at 52d Ann. Meeting of the Highway Res. Board, Washington, D. C., Jan. 1973
(PB-224430/9GA; HRB-Record-452; LC-73-15101; ISBN-0-309-02184-7) Avail: NTIS MF $145; National Academy of Sciences 2101 Constitution Ave., N.W., Washington, D. C. 20418 HC $2.20 CSCL 13B

The use of photogrammetric analysis to plan and develop highway corridors for recreational areas activities as well as for landscape aesthetics in urban and rural areas is reported. Included in the survey are data on the use of aerial mapping for highway development, aerial survey of highways in North America, remote sensing for environmental analysis, semiautomated large scale mapping, and measuring and depicting trouble areas in stereomodels. E.H.W.

N74-18115# Ohio State Univ., Columbus. Engineering Experiment Station.
MEASUREMENT OF MECHANICAL STRESSES USING PIEZOELECTRIC CRYSTALS Final Report
R. C. McMaster and M. L. Rhoten Dec. 1972 52 p Sponsored by Ohio State Dept. of Highways and Federal Highway Administration
(PB-223796/4GA; EES-292) Avail: NTIS HC $4.75 CSCL 13B

The research program was initiated with a feasibility study on the possible uses of piezoelectric ceramic materials for the measurement of mechanical energies related to highway problems. This interest was generated because modern man-made piezoelectric ceramic materials exhibit the property of generating an electrical signal of considerable magnitude when mechanical stresses are applied to the crystal. Upon completion of the fundamental study it was evident that piezoelectric ceramic transducers could be used to measure mechanical forces in various applications to highway problems. Prototype 1 has been completed and laboratory and limited field tests have been conducted. Prototype 2 has been built but no tests have been conducted. (Modified author abstract) GRA

N74-18116# Naval Research Lab., Washington, D.C.
THE DETERMINATION OF OIL SLICK THICKNESS BY MEANS OF MULTIFREQUENCY PASSIVE MICROWAVE TECHNIQUES Interim Report
James P. Hollinger 15 Jun. 1973 73 p refs
(AD-771376; NRL-7110-1) Avail: NTIS CSCL 13/2

A technique for the remote determination of the thickness and volume of sea surface oil spills using multifrequency microwave radiometry is investigated. Aircraft-borne measurements were made at 19.3 and at 31.0 or 69.8 GHz of eight controlled marine oil spills. The spills consisted of from 200 to 630 gallons of either No. 2 fuel oil or No. 4 or No. 6 crude oil. The slicks always formed an identifiable region with film thicknesses of a millimeter or more and containing the majority of oil which was surrounded by a very much larger and thinner slick which contained very little of the oil. (Modified author abstract) GRA

N74-18117# Purdue Univ., Lafayette, Ind. Thermophysical Properties Research Center.
CRITICAL EVALUATION OF FLASH METHOD FOR MEASURING THERMAL DIFFUSIVITY Final Report, 1 Sep. 1971 - 31 Aug. 1973
R. E. Taylor 15 Oct. 1973 55 p refs
(Grant NSF GK-23247)
(PB-225591/7GA; PRF-6764) Avail: NTIS HC $3.50 CSCL 14B

The flash method is being used to generate over 75% of the current measurements of thermal diffusivity. The sources of error for this method, including measurement errors and boundary conditions (finite pulse-time effect, heat losses and non-uniform heating) are evaluated. The use of digital data acquisition systems for recording the transient experimental data is shown to significantly reduce measurement errors and to provide valuable information for detecting and evaluating boundary condition errors. It is shown that errors due to finite pulse-time, non-uniform heating, and heat losses can often be adequately corrected for. In certain situations the method can be extended to include nondestructive testing of large artifacts. GRA

N74-18118# Panametrics, Inc., Waltham, Mass.
DESIGN, FABRICATION AND FLIGHT OF AN ULTRAVIOLET INTERFERENCE-FILTER SPECTROPHOTOMETER ABOARD A WB57F HIGH ALTITUDE AIRCRAFT Annual Report, 1 Sep. 1972 - 31 Aug. 1973
Bach Sellers, Frederick A. Hanser, and Jean L. Hunerwadel Oct. 1973 67 p refs Sponsored in part by DOT
(Contract N00014-73-C-0316; NR Proj. 980-101;

NR Proj. 082-309)
(AD-771455; PANA-UVS-1) Avail: NTIS CSCL 14/2

An ultraviolet interference-filter spectrophotometer has been designed, fabricated, and installed on a WB57F high altitude (about 60 kft) aircraft. This instrument (designated the UVS, or UV Spectrophotometer) uses a UV diffuser, ten filters (sets) placed in a rotating wheel, and a high grade ruggedized photomultiplier to provide 12 second time-resolved UV spectra in the region between 200 and 400 nm. The objectives of the UVS are to provide SST altitude UV flux data (1) of aid in interpretation of other, simultaneous measurements made on the aircraft, and (2) for purposes of long term monitoring of geographical and seasonal variations. Results of the first Airstream series on which the UVS was used are reported, and additional atmospheric monitoring applications of the instrument are discussed. (Modified author abstract) GRA

N74-18119# Ballistic Research Labs., Aberdeen Proving Ground, Md. Concepts Analysis Lab.
TIME-RESPONSE CHARACTERISTICS OF AN ALUMINUM-OXIDE SENSOR
John A. Vanderhoff Nov. 1973 30 p refs
(DA Proj. 1T1-61102-B-53A)
(AD-771132; BRL-1685) Avail: NTIS CSCL 04/2

A laboratory study of aluminum-oxide water-vapor sensors has been made to determine whether this type of sensor is suitable for measuring the concentration of water vapor in the stratosphere aboard a balloon-borne probe. The stationary afterglow facility at the BRL was used to test the time response of the sensor at room temperature (296K) and under static conditions (no gas flow). The laboratory results indicate response times on the order of hours for water-vapor pressures of a few mTorr (dew/frost point of about -70C). Author (GRA)

N74-18120# Army Foreign Science and Technology Center, Charlottesville, Va.
ACCURACY OF DETERMINATION OF REAL AZIMUTHS WITH THE Gi-C2 GYROTHEODOLITE
R. S. Sidorik and G. F. Melnikov 6 Aug. 1973 8 p refs Transl. into ENGLISH from Geod., Kartografiya i Aerofotosemka (USSR), no. 7, 1968 p 52-55
(AD-771211; FSTC-HT-23-425-73) Avail: NTIS CSCL 20/6

The Gi-C2 gyrotheodolite, made by the Hungarian firm MOM, is tested and found accurate up to plus or minus 10 sec. Comparative data and diagrams are included. GRA

N74-18121# Hughes Research Labs., Malibu, Calif.
MATERIALS FOR HOLOGRAPHIC OPTICAL ELEMENTS Technical Report, 15 Feb. 1972 - 1 Sep. 1973
D. H. Close and A. Graube Oct. 1973 132 p refs
(Contract F33615-73-C-5137; AF Proj. 7360)
(AD-771775; AFML-TR-73-267) Avail: NTIS CSCL 14/5

An experimental program was conducted to develop a hologram recording material sensitive at 545 nm, suitable for producing high quality holographic optical elements on spherical plastic visor substrates. Emphasis was placed on dye sensitized dichromated gelatin. Two techniques were developed for preparing gelatin films: a casting technique for basic experiments and a dip-coating technique for spherical plastic visors. Preliminary experiments developed several image measurements for evaluating recording materials. These experiments verified the use of the surface grating equation for calculating external reconstructed ray directions from thick holograms, compared theoretical and observed angular sensitivity for a standard dichromated gelatin film, and evaluated interferometric and Hartmann tests of asymmetric holograms to monitor film stability. Basic experiments on dye sensitized dichromated gelatin determined dye absorption and solubility in the presence of dichromate, studied sensitive as a function of wavelength, and optimized pre-exposure processing and development procedures. (Modified author abstract) GRA

N74-18122# General Dynamics Corp., San Diego, Calif. Electronics Div.
MICROWAVE TECHNIQUES FOR IMAGING OBJECTS BURIED BELOW THE SURFACE OF THE GROUND Final Report, Apr. 1971 - Aug. 1973
G. Tricoles, E. L. Rope, and O. C. Yue Jul. 1973 191 p refs
(Contract DAAK02-71-C-0264)
(AD-771988; R73-039) Avail: NTIS CSCL 17/4

Microwave imaging of buried objects was demonstrated. Laboratory apparatus, an approximate theory for scattering, and two methods for imaging were developed. Properties of antennas near the soil were investigated. Images were formed by optical reconstruction from detour phase holograms and by Fourier transformation based on the angular spectrum concept.
Author (GRA)

N74-18033* California Univ., Davis. Dept. of Agricultural Engineering.
INVESTIGATION OF ATMOSPHERIC EFFECTS IN IMAGE TRANSFER Special Study No. 4
K. L. Coulson and R. L. Walraven *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 33 p refs (For availability see N74-18025 09-13)
CSCL 14E

N74-18433* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHOTOGRAPHIC SUMMARY
M. C. McEwen and Vel S. Clanton *In its* Apollo 17 Prelim. Sci. Rept. 1973 32 p (For availability see N74-18428 09-30)
CSCL 14E

N74-18434* Brown Univ., Providence, R.I.
NEAR-TERMINATOR AND EARTHSHINE PHOTOGRAPHY
James W. Head and Douglas Lloyd (Bell Telephone Labs.) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 7 p refs (For availability see N74-18428 09-30)
CSCL 14E

N74-18481* Geological Survey, Washington, D.C.
EFFECT OF PHOTOGRAMMETRIC READING ERROR ON SLOPE-FREQUENCY DISTRIBUTIONS
H. J. Moore and Sherman S. C. Wu *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 14E

N74-18482* Geological Survey, Washington, D.C.
REPEATABILITY OF ELEVATION MEASUREMENTS: APOLLO PHOTOGRAPHY
Sherman S. C. Wu, Francis J. Schafer, Gray M. Nakata, and Raymond Jordon *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 6 p refs (For availability see N74-18428 09-30)
CSCL 14E

N74-18483* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO 17 LASER ALTIMETER
W. R. Wollenhaupt, W. L. Sjogren (JPL), R. E. Lingenfelter (Calif. Univ., Los Angeles), G. Schubert (Calif. Univ., Los Angeles), and W. M. Kaula (Calif. Univ., Los Angeles) *In its* Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 14B

N74-18484* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ZODIACAL LIGHT PHOTOGRAPHY
R. D. Mercer (Didlye Obs.), L. Dunkelman, and R. E. Evans *In its* Apollo 17 Prelim. Sci. Rept. 1973 3 p refs (For availability see N74-18428 09-30)
CSCL 14E

N74-18485* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOLAR CORONA PHOTOGRAPHY
R. M. MacQueen, C. L. Ross, and R. E. Evans *In its* Apollo 17 Prelim. Sci. Rept. 1973 3 p refs (For availability see N74-18428 09-30)
CSCL 14E

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-18123* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPARATUS FOR REMOTE HANDLING OF MATERIALS Patent
Robert B. Kimball (N. Am. Rockwell Corp., Downey, Calif.), David T. Hodder (N. Am. Rockwell Corp., Downey, Calif.), and Walter W. Wrinkle, inventors (to NASA) (N. Am. Rockwell Corp., Downey, Calif.) Issued 5 Feb. 1974 9 p Filed 30 Dec. 1971 Supersedes N72-21476 (10 - 12, p 1617) Sponsored by NASA
(NASA-Case-LAR-10634-1; US-Patent-3,790,347;
US-Patent-Appl-SN-214084; US-Patent-Class-23-253PC;
US-Patent-Class-23-259; US-Patent-Class-259-72;
US-Patent-Class-312-209; US-Patent-Class-356-85;
US-Patent-Class-356-197) Avail: US Patent Office CSCL 13I

Apparatus for remote handling of materials are described. A closed housing is provided with first and second containers and first and second reservoirs for holding materials to be mixed. The materials are transferable from the reservoirs to the first container where they are mixed. The mixed materials are then conveyed from the first container to the second container preferably by dumping the mixed materials into a funnel positioned over the second container. The second container is then moved to a second position for analysis of the mixed materials. For example, the materials may be ignited and the flame analyzed. Access, such as a sight port, is provided in the housing at the analysis position. The device provides a simple and inexpensive apparatus for safely mixing a pyrophoric material and an oxidizer which together form a thermite type mixture that burns to produce a large quantity of heat and light.

Official Gazette of the U.S. Patent Office

N74-18124* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
METHOD FOR COMPRESSION MOLDING OF THERMOSETTING PLASTICS UTILIZING A TEMPERATURE GRADIENT ACROSS THE PLASTIC TO CURE THE ARTICLE Patent
Wilbur C. Heier, inventor (to NASA) Issued 5 Feb. 1974 5 p Filed 15 Nov. 1971 Supersedes N72-21484 (10 - 12, p 1618)
(NASA-Case-LAR-10489-1; US-Patent-3,790,650;
US-Patent-Appl-SN-198763; US-Patent-Class-264-102) Avail: US Patent Office CSCL 13H

A method is described for compression molding of thermosetting plastics composition. Heat is applied to the compressed load in a mold cavity and adjusted to hold molding temperature at the interface of the cavity surface and the compressed compound to produce a thermal front. This thermal front advances into the evacuated compound at mean right angles to the compression load and toward a thermal fence formed at the opposite surface of the compressed compound.

Official Gazette of the U.S. Patent Office

N74-18125* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OMNIDIRECTIONAL WHEEL Patent
Josef F. Blumrich, inventor (to NASA) Issued 5 Feb. 1974 8 p Filed 17 Apr. 1972 Supersedes N72-25490 (10 - 16, p 2163)
(NASA-Case-MFS-21309-1; US-Patent-3,789,947;
US-Patent-Appl-SN-244519; US-Patent-Class-180-79.3;
US-Patent-Class-301-5P) Avail: US Patent Office CSCL 13I

The apparatus consists of a wheel having a hub with radially disposed spokes which are provided with a plurality of circumferential rim segments. These rim segments carry, between the spokes, rim elements which are rigid relative to their outer support surfaces, and defined in their outer contour to form a part of the circle forming the wheel diameter. The rim segments have provided for each of the rim elements an independent drive means selectively operable when the element is in ground contact to rotatably drive the rim element in a direction of movement perpendicularly lateral to the normal plane of rotation and movement of the wheel. This affords the wheel omnidirectional movement.

Official Gazette of the U.S. Patent Office

N74-18126* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REINFORCED POLYQUINOXALINE GASKET AND METHOD OF PREPARING THE SAME Patent
Richard VanAuken, inventor (to NASA) (Whittaker Corp., San Diego, Calif.) Issued 5 Feb. 1974 5 p Filed 30 Dec. 1971 Supersedes N72-20460 (10 - 11, p 1481) Sponsored by NASA
(NASA-Case-MFS-21364-1; US-Patent-3,790,432;
US-Patent-Appl-SN-214006; US-Patent-Class-161-93;
US-Patent-Class-156-331; US-Patent-Class-161-42;
US-Patent-Class-161-43; US-Patent-Class-161-182;
US-Patent-Class-161-192; US-Patent-Class-260-2R;
US-Patent-Class-264-135; US-Patent-Class-264-136;
US-Patent-Class-264-257) Avail: US Patent Office CSCL 13I

A gasket or seal resistant to ionizing radiation and liquid hydrogen temperatures is made up of a laminated polyquinoxaline resin-fiberglass cloth body portion and a molded polyquinoxaline encapsulating film. The laminated body is prepared by stacking thin sheets of the resin alternately with fiberglass cloth and heating the assembly under pressure with the temperature, pressure and resin film thickness being controlled so that only partial impregnation of the fiberglass cloth is produced. The encapsulating resin film is preheated at about 300 f and applied to the laminate body by molding at a temperature of about 625 F. The molded gasket is then deflashed and post-cured by heating at 675 to 700 F.

Official Gazette of the U.S. Patent Office

N74-18127* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MANUAL ACTUATOR Patent
Raymond L. Gause and C. G. Glenn, inventors (to NASA) Issued 29 Jan. 1974 5 p Filed 27 Jun. 1972 Supersedes N73-15503 (11 - 06, p 0676)
(NASA-Case-MFS-21481-1; US-Patent-3,788,163;
US-Patent-Appl-SN-266771; US-Patent-Class-74-594.6;
US-Patent-Class-74-594.7; US-Patent-Class-128-25R;
US-Patent-Class-272-73; US-Patent-Class-272-80) Avail: US Patent Office CSCL 13I

An actuator for an exercising machine employable by a crewman aboard a manned spacecraft is presented. The actuator is characterized by a force delivery arm projected from a rotary imput shaft of an exercising machine and having a force input handle extended orthogonally from its distal end. The handle includes a hand-grip configured to be received within the palm of the crewman's hand and a grid pivotally supported for angular displacement between a first position, wherein the grid is disposed in an overlying juxtaposition with the hand-grip, and a second position, angularly displaced from the first position, for affording access to the hand-grip, and a latching mechanism fixed to the sole of a shoe worn by the crewman for latching the shoe to the grid when the grid is in the first position.

Official Gazette of the U.S. Patent Office

N74-18128* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIFFUSION WELDING IN AIR Patent
Thomas J. Moore and Kenneth H. Holko, inventors (to NASA) Issued 29 Jan. 1974 6 p Filed 24 Apr. 1972 Supersedes N72-25471 (10 - 16, p 2161)
(NASA-Case-LEW-11387-1; US-Patent-3,787,959;
US-Patent-Appl-SN-247090; US-Patent-Class-29-482;
US-Patent-Class-29-488; US-Patent-Class-29-497;
US-Patent-Class-29-498) Avail: US Patent Office CSCL 13H

Solid state welding a butt joint by fusion welding the peripheral surfaces to form a seal is described along with, autogenetically cleaning the faying or mating surfaces of the joint by heating the abutting surfaces to 1,200 C and heating to the diffusion welding temperature in air.

Official Gazette of the U.S. Patent Office

N74-18129*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF GAS-LUBRICATED CRUCIFORM-MOUNTED TILTING-PAD JOURNAL BEARINGS AND A DAMPED FLEXIBLY MOUNTED SPIRAL-GROOVE THRUST BEARING
Lloyd W. Ream Washington Mar. 1974 25 p refs
(NASA-TM-X-2999; E-7675) Avail: NTIS HC $3.00 CSCL 13I

A test program was conducted to determine the performance characteristics of gas-lubricated cruciform-mounted tilting-pad journal bearings and a damped spiral-groove thrust bearing designed for the Brayton cycle rotating unit (BRU). Hydrostatic, hybrid (simultaneously hydrostatic and hydrodynamic), and hydrodynamic tests were conducted in argon gas at ambient pressure and temperature ranges representative of operation to the 10.5 kWe BRU power-generating level. Performance of the gas lubricated bearings is presented including hydrostatic gas flow rates, bearing clearances, bearing temperatures, and transient performance. Author

N74-18130*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN INVESTIGATION OF CHATTER AND TOOL WEAR WHEN MACHINING TITANIUM
Ian A. Sutherland Jan. 1974 77 p refs
(NASA-TM-X-64830) Avail: NTIS HC $7.00 CSCL 13I

The low thermal conductivity of titanium, together with the low contact area between chip and tool and the unusually high chip velocities, gives rise to high tool tip temperatures and accelerated tool wear. Machining speeds have to be considerably reduced to avoid these high temperatures with a consequential loss of productivity. Restoring this lost productivity involves increasing other machining variables, such as feed and depth-of-cut, and can lead to another machining problem commonly known as chatter. This work is to acquaint users with these problems, to examine the variables that may be encountered when machining a material like titanium, and to advise the machine tool user on how to maximize the output from the machines and tooling available to him. Recommendations are made on ways of improving tolerances, reducing machine tool instability or chatter, and improving productivity. New tool materials, tool coatings, and coolants are reviewed and their relevance examined when machining titanium. Author

N74-18131*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF MAKING AN APERTURED CASTING Patent Application
Andrew Terpay, inventor (to NASA) Filed 27 Feb. 1974 7 p
(NASA-Case-LEW-11169-1; US-Patent-Appl-SN-446568) Avail: NTIS HC $4.00 CSCL 13/4

A method for producing an apertured casting is described. The casting is produced by forming a duplicate in the shape of the finished casting, positioning refractory metal wires to form apertures, and firing the ceramic duplicate in a furnace. The heat of the furnace removes the wires by sublimation and leaves the desired apertures in the casting. NASA

N74-18132*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AXIALLY AND RADIALLY CONTROLLABLE MAGNETIC BEARING Patent Application
Leo J. Veillette, inventor (to NASA) Filed 8 Feb. 1974 24 p
(NASA-Case-GSC-11551-1; US-Patent-Appl-SN-440917) Avail: NTIS HC $4.25 CSCL 13I

To overcome the problems of bearing friction in relatively large spinning structures, a pair of magnetic bearings were used to suspend or levitate the ends of the axis of a spinning rotor relative to a stator by magnetic forces or flux concentrated in relatively narrow air or vacuum gaps between the bearing rotor and stator. Permanent magnets carried by the rotor generate constant axial bias fluxes in each of the air gaps. A pair of coils, disposed to axially excite the air gaps with variable flux, are driven in a manner so that the sum of the total fluxes in each of the air gaps is varied to change the radial stiffness between the bearing rotor and stator. Axial force between the rotor and stator is produced by exciting the two coils to vary the difference of the total air gap fluxes. The pair of coils are driven in a bridge circuit by pulse width modulated signals. NASA

N74-18133*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DRILLED BALL BEARING WITH A ONE PIECE ANTI-TIPPING CAGE ASSEMBLY Patent Application
Arthur S. Irwin, inventor (to NASA) (Marlin-Rockwell Corp.) Filed 12 Mar. 1974 9 p
(Contract NAS3-15343)
(NASA-Case-LEW-11925-1; US-Patent-Appl-SN-450505) Avail: NTIS HC $4.00 CSCL 13I

A drilled ball bearing with a pair of projections formed from the inner surface of each of the cage pockets is described. The projections prevent misorientation of the openings of the drilled passages of the balls with respect to the surfaces of the inner and outer races. The machining of the projections from the inner surface of each of the cage pockets forms a one piece structure. This structure has improved resistance to fragmentation caused by either thermal or vibrational effects when compared with conventional two piece anti-tipping cage assemblies. NASA

N74-18134*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
JOURNAL BEARINGS Patent Application
Fredrick T. Schuller and Warren A. Moore, inventors (to NASA) Filed 25 Feb. 1973 8 p
(NASA-Case-LEW-11076-4; US-Patent-Appl-SN-445178) Avail: NTIS HC $4.00 CSCL 13I

The characteristics of a bearing designed to reduce the instability of lightly loaded shafts rotating at high speeds are discussed. The bearing is of fixed geometry and uses several sectors to provide the lobed areas which function as a pump when the rotor turns. The resulting pressure distribution produces a hydrostatic effect which stabilizes the motion of the shaft. Drawings of the bearing are provided. NASA

N74-18135# Sandia Labs., Albuquerque, N.Mex.
STUDY OF LEAD FRAME PLATING VARIABLES
D. R. Johnson and R. L. Hatcher Oct. 1973 66 p refs
(Contract AT(29-1)-789)
(SC-DR-72-0647) Avail: NTIS HC $5.50

A four-phase investigation was conducted of lead frame electroplating variables and their contribution to thermocompression bond quality in hybrid microcircuits: gold plating hardness and purity; nickel plating thickness; gold plating thickness; and combined variable proof test. NSA

N74-18136# Franklin Inst. Research Labs., Philadelphia, Pa.
SUPPLEMENTAL DATA FOR INVESTIGATION OF SLIDING-SURFACE BEARINGS OF SCREW PUMPS UTILIZED ON THE NAVY DISTILLATE FUEL OIL CONVERSION PROGRAM
Harry C. Rippel, Iqbal M. Anwar, and Wilbur Shapiro Dec. 1973 291 p
(Contract N00014-69-C-0055)
(AD-771378; FIRL-I-C2429-5S) Avail: NTIS CSCL 13/9

Contents: Performance of journal bearings at transition and nominal operating conditions; Critical discharge pressure for journal bearings vs fuel oil viscosity; Journal bearing boundary friction energy density vs fuel oil viscosity. GRA

N74-18137# Battelle Columbus Labs., Ohio. Metals and Ceramics Information Center.
FORGING EQUIPMENT, MATERIALS, AND PRACTICES Final Report, 1 May 1971 - 28 Feb. 1973
Taylan Altan, Francis W. Boulger, James R. Becker, Nuri Akgerman, and Harold J. Henning Oct. 1973 502 p refs
(Contract F33615-71-C-1565)
(AD-771344; MCIC-HB-03) Avail: NTIS CSCL 13/8

The handbook provides design engineers with up-to-date information about the many aspects of forging including descriptions of important developments made more recently by industry and/or government. The handbook describes suitable measures for in-process quality control and quality assurance, summarizes relationships between forging practices and important mechanical properties and compares various forging devices to

aid in equipment selection. Attention is also given to describing practices for relatively new materials and emerging forging practices. (Modified author abstract) GRA

N74-18138# Timken Roller Bearing Co., Canton, Ohio.
DEVELOPMENT OF HIGH SPEED TAPERED ROLLER BEARING Interim Report, 1 Jul. 1972 - 1 Jul. 1973
Robert F. Cornish, Peter S. Orves, and Shionarayan R. Gupta Wright-Patterson AFB, Ohio AFAPL Oct. 1973 145 p refs
(Contract F33615-72-C-1890; AF Proj. 3048)
(AD-771547; AFAPL-TR-73-85; IR-1) Avail: NTIS CSCL 13/9

The report presents the analytical work conducted to evaluate the effects of various material, design and lubrication parameters on the performance of a high speed tapered roller bearing. The program objective is to operate the proposed bearing to 3.5 million DN (107.95 mm bore x 32422 RPM) under 5000 pounds thrust load. The analysis includes the following: bearing geometry and design, effects of fit, kinematics, dynamics, load distribution, stresses, EHD and friction forces, analysis of the cone rib lubrication system. Author (GRA)

N74-18139# Norton Co., Worcester, Mass. Industrial Ceramics Div.
SILICON NITRIDE IN ROLLING CONTACT BEARINGS Final Report, 3 Jan. - 3 Oct. 1973
H. Robert Baumgartner, David V. Sundberg, and William M. Wheildon Oct. 1973 85 p refs
(Contract N00019-73-C-0193)
(AD-771393) Avail: NTIS CSCL 13/9

The investigation was concerned with the evaluation of hot pressed silicon nitride as a bearing material. Its organization was divided into three principal activities: (1) rolling contact fatigue testing of silicon nitride rod specimens (2) the design and fabrication of two types of high speed, silicon nitride containing, roller bearings and (3) the accelerated testing of these full-scale roller bearings. GRA

N74-18140# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
A THERMAL CONTROL SYSTEM FOR THE KS-87B CAMERA
Hugh W. Davis Aug. 1973 78 p refs
(AF Proj. 7646)
(AD-771619; AFAL-TR-73-158) Avail: NTIS CSCL 14/5

Thermal gradients within the lens cone of the KS-87B aerial camera cause focal length changes which degrade photographic quality. A thermal control system has been developed in an attempt to maintain isothermal conditions at 105F within the lens cone. It consists of a thermal blanket, a heater film sandwiched between two layers of insulation, and thermostatic controls. Testing was accomplished in natural indoor and outdoor environments, using thermistors to measure temperatures at 14 locations within the system. Tests revealed that temperature differences between different parts of the lens did not exceed 4F in an environment of 33F ambient temperature. This thermal control system is simple, reliable, and relatively inexpensive. (Modified author abstract) GRA

N74-18141# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THE POSSIBILITY OF UNGLUING OF THE FILLER IN PROBLEMS ON THE TRANSITION PROCESSES OF DEFORMATION IN A CYLINDRICAL CASING WITH AN ELASTIC FILLER
B. V. Gulin 27 Nov. 1973 8 p Transl. into ENGLISH from Issled. po Teor. plastin i Obolochek (USSR), no. 8, 1972 p 346-350
(AD-771622; FTD-HT-23-364-74) Avail: NTIS CSCL 20/11

The case of a nonabsolute rigid cementing of a filler with a casing is studied. The boundary conditions on the external surface of the filler are formulated. If the algorithm casing is assumed absolutely rigid, the displacements of the external surface of the cylinder are determined. K.M.M.

N74-18142# Battelle Columbus Labs., Ohio.
THE APPLICATION OF OIL ANALYSIS TECHNIQUES TO THE DIAGNOSIS OF CONDITION AND PREDICTION OF FAILURE IN US ARMY CONSTRUCTION VEHICLES Final Report, 15 Mar. - 5 Nov. 1973
W. A. Glaeser, F. D. Newman, and D. K. Snediker 5 Nov. 1973 102 p refs
(Contract DAAK02-73-C-0217; DA Proj. 1G6-62708-D-549)
(AD-770461) Avail: NTIS CSCL 07/4

The report describes the results of a study intended to define and critically analyze the state of the art in machine condition diagnosis and failure prediction by the analysis of lubricating oils or working fluids. The numerous on-going programs in spectrographic oil analysis are discussed in detail and other applicable analytical techniques are analyzed. Recommendations are made with regard to the application of oil or hydraulic fluid analysis techniques to the maintenance of U.S. Army construction vehicles. On the basis of the state of existing technology and the unique requirements associated with Army construction vehicles, a development program, leading to field test and strap-on monitors, is outlined. A comprehensive bibliography is included. (Modified author abstract) GRA

N74-18143# Army Foreign Science and Technology Center, Charlottesville, Va.
CALCULATION OF THE ENERGY BALANCE IN EXPLOSION WELDING
V. S. Sedykh and A. P. Sonnov 24 Jul. 1973 15 p refs Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (USSR), no. 2, 1970 p 6-13
(AD-771396; FSTC-HT-23-2049-72) Avail: NTIS CSCL 13/8

A system for determining the elements of the energy balance of the explosion welding process of flat joints was performed by use of experiments in calorimetry of explosion welded plates. GRA

N74-18144# Army Materials and Mechanics Research Center, Watertown, Mass.
IMPULSE RESISTANCE SINTERING OF COMPOUNDS FOR ARMOR APPLICATIONS
Saul Isserow Sep. 1973 19 p refs
(DA Proj. 1T0-62105-A-328)
(AD-771032; AMMRC-TR-73-43) Avail: NTIS CSCL 13/8

The extension of the applicability of impulse resistance sintering was demonstrated in a newly assembled unit with a 10,000-ampere capability. Compositions in the Ti-B system have received primary attention for possible armor application. Round disks with up to five-inch diameter and four-inch squares were made with a titanium-TiB2 blend corresponding to Ti(0.7)B. Tooling for such compacts is described. Smaller compacts have been prepared with different degrees of success from other materials, including light, hard compounds and several metals. Author (GRA)

N74-18145# Summa Corp., Culver City, Calif. Helicopters Div.
DEVELOPMENT OF A LOW-COST COMPOSITE DIE USING HIGH-ENERGY-RATE FORMING (HERF) Final Report
Gordon K. Dingle and Joseph E. Leach, Jr. Nov. 1973 51 p
(Contract DAAG46-73-C-0028)
(AD-771957; HH-73-76; AMMRC-CTR-73-43) Avail: NTIS CSCL 13/9

A program was conducted to design, fabricate, and test/evaluate a low-cost composite die system for high-energy-rate forming (HERF) of titanium and high-temperature alloy parts commonly used on helicopters. The composite die design was evaluated by conducting forming operations on seven pieces of 321 stainless steel and eight pieces of 6Al-4V titanium alloy. The composite die met the design objectives of low cost (half that of conventional dies), short lead time (at least half that of conventional dies), and medium life (500 cycles). (Modified author abstract) GRA

N74-18146# Franklin Inst. Research Labs., Philadelphia, Pa.
INVESTIGATION OF SLIDING-SURFACE BEARINGS OF SCREW PUMPS UTILIZED ON THE NAVY DISTILLATE FUEL OIL CONVERSION PROGRAM Final Report, Nov. 1972 - Sep. 1973
Harry C. Rippel, Iqbal M. Anwar, and Wilbur Shapiro Dec. 1973 286 p
(Contract N00014-69-C-0055)

(AD-771453; FIRL-I-C2429-5) Avail: NTIS CSCL 13/9

The report describes the evaluation of IMO pumps used in Naval fuel oil systems. Conversion to distillate fuels resulted in high failure rates due to poor lubrication and high fuel contamination. The effort primarily concentrated on the analytical study of the bearings when using NSFO and distillate-type fuels, i.e., ND, DFM and JP-5. The analytical approach developed allows evaluation of bearing performance when the mode of the bearing operation is either full-film hydrodynamic or mixed film. With regard to the mixed-film evaluation, the criterion of boundary friction energy density was selected. This criterion is a measure of bearing distress as provided by the product of metal-to-metal contact friction force per unit area times sliding velocity. Forty different pump models belonging to five different pump series were evaluated. (Modified author abstract) GRA

N74-18147# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTS WITH LASER-BEAM WELDING

Tibor Szucs and Istvan Barany 5 Dec. 1973 17 p refs Transl. into ENGLISH from Finommechanika (Hungary), no. 2, Feb. 1972 p 39-44

(AD-772036; FTD-HC-23-498-74) Avail: NTIS CSCL 13/8

The experiments covered the weld-joining and perforation of various metals (in the form of thin sheet, foil, and wire). The article summarizes the experiences gained in the course of the experiments, and compares the experiences with results published in the literature. GRA

N74-18148# Defense Documentation Center, Alexandria, Va.

MACHINING Bibliography Report, Jan. 1957 - Aug. 1973

Dec. 1973 198 p refs

(AD-771800; DDC-TAS-73-79) Avail: NTIS CSCL 13/8

The bibliography is a collection of references relating to machining variables. Tool materials, tool geometry, cutting fluids, depth, feed, and tool life, as well as material groups, are discussed. Corporate Author/Monitoring Agency, Subject, Title, and Personal Author Indexes are included. Author (GRA)

N74-18149*# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.

PROCEEDINGS OF THE 18TH MEETING OF THE MECHANICAL FAILURES PREVENTION GROUP

T. R. Shives, ed. and W. A. Willard, ed. Sep. 1973 262 p refs Conf. held at Gaithersburg, Md., 8-10 Nov. 1972 Sponsored jointly by NASA and Office of Naval Res.

(NBS Proj. 3120402)

(NASA-CR-137149; AD-772082; NBSIR-73-252) Avail: NTIS HC $16.25 CSCL 14B

Failure detection, diagnosis, and prognosis represent the central theme of the proceedings. Bearing condition monitoring, diagnostic systems technology and applications, and new approaches in sensing and processing are discussed. (Modified author abstract) GRA

N74-18150# SKF Industries, Inc., King of Prussia, Pa.

FEASIBILITY OF TAPERED ROLLER BEARINGS FOR MAIN-SHAFT ENGINE APPLICATIONS Final Report, 25 May 1970 - 25 Nov. 1972

Thomas E. Conners and Frank R. Morrison Aug. 1973 175 p refs

(Contract DAAJ02-70-C-0047; DA Proj. 1F1-62203-A-119)

(AD-771984; SKF-AL73T009; USAAMRDL-TR-73-46) Avail: NTIS CSCL 13/9

A survey of 2-to 10-pounds/second-airflow aircraft gas turbine manufacturers indicated an increase in shaft speed in projected applications. A shaft speed increase results in an increase in the load-carrying requirement, and contact stresses due to centrifugal forces on the rolling elements, in the main-shaft bearings. One approach to reducing the contact stresses in the thrust-loaded bearing is to increase the contact area between the rolling elements and races by using tapered roller bearings in place of angular-contact ball bearings. An analytical study of tapered roller bearings is discussed, and the results of an analysis are given in which the principal design parameters were varied to optimize the design for high speed. This analysis included the standard inner ring flange design and a novel outer ring flange design. The results of tests performed with three different tapered roller bearing designs (commercial, aircraft-quality inner ring flange, outer ring flange) are presented. (Modified author abstract) GRA

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-18151# Joint Publications Research Service, Arlington, Va.

DESIGN OF GAS DYNAMIC CO2 LASER. 1: AMPLIFICATION FACTOR

L. S. Krasitskaya, A. P. Napartovich, and V. F. Sharkov 12 Feb. 1974 12 p refs Transl. into ENGLISH from Teplofiz. Vys. Temp. (Moscow), v. 11, no. 6, 1973 p 1155-1161

(JPRS-61199) Avail: NTIS HC $4.00

A discussion is given of the problem of determining the amplification factor of a CO2 gas dynamic laser. Results of calculations are presented in graphical form. Author

N74-18152*# AiResearch Mfg. Co., Los Angeles, Calif.

APPLICATION OF HOLOGRAPHY TO FLOW VISUALIZATION WITHIN ROTATING COMPRESSOR BLADE ROW Final Report

R. F. Wuerker, R. J. Kobayashi, L. O. Heflinger, and T. C. Ware Feb. 1974 135 p refs

(Contract NAS3-15336)

(NASA-CR-121264; AiResearch-73-9489) Avail: NTIS HC $9.75 CSCL 20E

Two holographic interblade row flow visualization systems were designed to determine the three-dimensional shock patterns and velocity distributions within the rotating blade row of a transonic fan rotor, utilizing the techniques of pulsed laser transmission holography. Both single- and double-exposure bright field holograms and dark field scattered-light holograms were successfully recorded. Two plastic windows were installed in the rotor tip casing and outer casing forward of the rotor to view the rotor blade passage. The viewing angle allowed detailed investigation of the leading edge shocks and shocks in the midspan damper area; limited details of the trailing edge shocks also were visible. A technique was devised for interpreting the reconstructed holograms by constructing three dimensional models that allowed identification of the major shock systems. The models compared favorably with theoretical predictions and results of the overall and blade element data. Most of the holograms were made using the rapid double-pulse technique. Author

N74-18153*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

TESTING DEVICE USING X-RAY LASERS Patent Application

Carroll C. Dailey, inventor (to NASA) Filed 25 Feb. 1974 7 p (NASA-Case-MFS-22409-1; US-Patent-Appl-SN-445398) Avail: NTIS HC $4.00 CSCL 20E

In order to test X-ray reflecting and focussing surfaces, an X-ray laser is placed near the surface to be tested to provide a nearly parallel beam of X-rays. The testing device is much smaller and more compact, and much less expensive, than conventional long-path vacuum X-ray generators. NASA

N74-18154# California Univ., Livermore. Lawrence Livermore Lab.

APPLICATION OF PULSED LASER-INDUCED STRESS WAVES

C. A. Calder and W. W. Wilcox 27 Sep. 1973 27 p refs

(Contract W-7405-eng-48)

(UCID-16353) Avail: NTIS HC $3.50

Very short duration stress waves generated by rapid energy deposition from a Q-switched ruby laser were used both to evaluate material properties by the Reynolds method and as a signal source for flaw detection. NSA

N74-18155# Sandia Labs., Albuquerque, N.Mex.

EFFICIENCY OF FLASHLAMP EXCITED LASERS

M. A. Gusinow Sep. 1973 10 p refs

(Contract AT(29-1)-789)
(SLA-73-905) Avail: NTIS HC $3.00

Assuming flash lamps to radiate as black bodies, the fractional number of photons within a given absorption band is calculated, along with the black body temperature required to optimize that fraction. Author (NSA)

N74-18156# California Univ., Livermore. Lawrence Livermore Lab.
OPERATIONAL EXPERIENCE WITH THE MULTIPASS 16 DISC LONG PATH LASER SYSTEM
J. W. Shearer and J. E. Swain 28 Sep. 1973 13 p refs
(Contract W-7405-eng-48)
(UCID-16358) Avail: NTIS HC $3.00

The operational and maintenance requirements are summarized for the Livermore long path laser system (the first short pulse neodynmium (lambda = 1.06 microns) glass disk laser systems). The system is scheduled to be shut down at the end of 1973. NSA

N74-18157# Royal Radar Establishment, Malvern (England).
PRECISION MOUNTS FOR LASER OPTICS
G. W. Fynn, N. A. Lowde, and W. J. A. Powell Feb. 1973 14 p refs
(RRE-769; BR35976) Avail: NTIS HC $4.00

Laser optic mounts designed on rigorously kinematic principles are described. Tests to establish the performances are detailed, and the conclusion is reached that these instruments offer a mechanical performance which is considerably superior to many devices currently available commercially at comparable prices. Author (ESRO)

N74-18158# Aerospace Corp., El Segundo, Calif. Lab. Operations.
LOW THRESHOLD, CW SUBMILLIMETER AND MILLIMETER WAVE LASER ACTION IN CO2 LASER-PUMPED C2H4F2, C2H2F2, AND CH3OH Technical Report, Feb. - May 1973
Dean T. Hodges, Richard D. Reel, and Daniel H. Barker 23 Nov. 1973 15 p refs
(Contract F04701-73-C-0074)
(AD-771482; TR-0074(4260-10)-2; SAMSO-TR-73-389) Avail: NTIS CSCL 20/5

CW laser action between 40.7 micrometers and 1.02 mm is described in 1, 1 difluoroethane, 1, 1 difluoroethylene, and methyl alcohol optically pumped by a CO2 laser. Far infrared radiation (FIR) laser threshold was achieved for CO2 pump powers of typically 1 to 2 watts, and FIR laser output powers of several milliwatts were observed on the stronger lines. (Modified author abstract) GRA

N74-18159# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Hypersonic Research Lab.
SUPERSONIC WIND TUNNEL INVESTIGATIONS USING PULSED LASER HOLOGRAPHY Interim Report
Albert G. Havener and Roger J. Radley, Jr. Oct. 1973 129 p refs
(AF Proj. 7064)
(AD-771617; ARL-73-0148) Avail: NTIS CSCL 20/4

Experimental data determined from the application of pulsed laser holography to supersonic wind tunnel experiments are presented. Both qualitative and quantitative data are shown for two-dimensional studies, and qualitative data are presented for three-dimensional axisymmetric and asymmetric tests. New data for a separated turbulent boundary layer are included and double pulsed holographic interferograms are used to determine the frequency of fluctuations in a separated flow field. Author (GRA)

N74-18160# Army Missile Command, Redstone Arsenal, Ala.
HCl CHEMICAL LASER
James A. Merritt and Hugh C. Gardner 16 Jan. 1973 16 p refs
(DA Proj. 1T6-62703-A-308)
(AD-771045; RR-73-1) Avail: NTIS CSCL 20/5

Several types of HCl lasers were observed in the region of the electromagnetic spectrum from about 3.5 to 3.9 micrometers. A number of reactants were screened in a pulsed electrical discharge system, and HCl lasing was observed from 26 transitions between vibrational-rotational energy levels. Author (GRA)

N74-18161# Army Tank-Automotive Center, Warren, Mich.
APPLICATION OF SCAN LASER HEATING FOR THERMAL IMAGERY NONDESTRUCTIVE TESTING
Gregory Arutunian and Otto Renius Oct. 1973 31 p refs
(AD-771052; TACOM-TR-11830) Avail: NTIS CSCL 14/2

Evaluations were made using an infrared non-destructive testing technique employing scan laser heating of the specimen. Thermal images were obtained with a newly developed two-dimensional reflective scanner, coupled to a 50 watt CO2 laser to irradiate the specimen and a thermal imaging camera to view the specimen's irradiated surfaces. The technique showed a capability of providing a real time non-destructive test for subsurface defects in a variety of materials and structures. It allows the laser heat source and infrared camera to be remotely positioned from the specimen under test, making it possible to examine large specimens. Author (GRA)

N74-18162# Sperry Univac, St. Paul, Minn. Defense Systems Div.
LASER LIGHT DEFLECTOR
D. L. Fleming, T. R. Johansen, A. D. Kaske, and E. J. Torok Nov. 1973 11 p refs
(Contract N00014-73-C-0308)
(AD-771431) Avail: NTIS CSCL 20/6

The need for a light deflector has become more pressing since the advent of lasers. Such applications as optical memories, a line scan illuminator, or search and track optical radar require a beam steering device. Properties such as high resolution, wide angle deflection - preferably in two dimensions-, high scan rates, high random access rates, and the ability to withstand extreme environments often encountered in tactical situations are sought. The magnetic stripe domain deflector offers important advantages in these respects over other methods that warrant further development. Thus this contract was let to evaluate the prospects of a stripe domain light deflector using such materials as bismuth-doped yttrium iron garnet (Bi: YIG), iron-chromium trihalides, and iron cobalt nickel borates for the green 5145 A Argon line. GRA

N74-18163# TRW Systems Group, Redondo Beach, Calif.
HIGH PERFORMANCE PULSED XENON-ION LASER DEVELOPMENT PROGRAM Final Report, 18 Dec. 1972 - 15 Dec. 1973
R. S. Witte 15 Dec. 1973 27 p
(Contract N60921-73-C-0146)
(AD-771401; TRW-23484-6001-RU-00) Avail: NTIS CSCL 20/5

The design and performances characteristics of a pulsed xenon-ion laser operating in the visible region (5353A) is discussed. GRA

N74-18164# California Univ., Berkeley. Dept. of Electrical Engineering.
OPTICAL COMMUNICATION SYSTEMS - CONFERENCE Semiannual Report, 1 Oct. 1972 - 30 Apr. 1973
John R. Whinnery, (ed.), Steven E. Schwarz, (ed.), and Lillian On, (ed.) 1973 172 p refs Presented at the 2nd Grantee-User Conf., Berkeley, Calif., 14-15 May 1973 Sponsored by NSF
(PB-225003/3GA) Avail: NTIS HC $4.75 CSCL 17B

The summaries of twenty projects in both devices and systems theory for optical communications systems are presented. Additionally, invited papers discuss some problems of interest to the communication theorist and device physicist, device research as seen from a systems point of view, the future of optical communication systems, and some mechanisms for university/industry cooperation in research. A summary of informal technical discussions is given. Author (GRA)

N74-18165# Stanford Univ., Calif. Microwave Lab.
RESEARCH STUDIES ON LASER HARMONIC GENERATION Annual Report
A. H. Kung, J. F. Young, and S. E. Harris Dec. 1973 49 p refs
(Contract N00014-67-A-0112-0036; NR Proj. 016-106)
(AD-771444; ML-2235) Avail: NTIS CSCL 20/5

The past year work has been concentrated on the construction of a high power Nd:YAG laser and generation of vacuum ultraviolet and soft X-ray radiation using harmonic techniques. The authors have successfully constructed and evaluated a laser system that yields a single 25 psec pulse with a peak power of about 5 x 10 to the 8th power watts, demonstrated the technique of generation of vacuum ultraviolet radiation in phase-matched mixtures of inert gases, and have demonstrated, for the first time, stimulated emission in multiple photon-pumped Xe and Ar excimers, leading to possibilities of broad band and tunable vacuum ultraviolet radiation. (Modified author abstract) GRA

N74-18166# Radio Corp. of America, Lancaster, Pa. Electro-Optics Products.
GaAs LARGE OPTICAL CAVITY (LOC) LASER DIODE FOR COMMUNICATIONS SYSTEMS Interim Technical Report, 15 Nov. 1972 - 15 May 1973
J. T. OBrien Sep. 1973 51 p refs
(Contract DAAB07-73-C-0062)
(AD-771141; ECOM-0062-1-73; ITR-1) Avail: NTIS CSCL 20/5

Work has been initiated on the development of an LOC laser diode to be used as the transmitting component for an optical communicator. During this first six month period, a package has been designed which meets the device requirements of low thermal resistance and low self inductance. A liquid phase epitaxial process has been developed to produce the multipler layer structures required to form the LOC lasing p-n junctions. Results of four layer structures are tabulated. Cross sections of typical layers are shown as photographed with a scanning electron microscope. Operating devices were constructed in which lasing was achieved at pulse repetition rates of 2.0 MHz and a duty cycle of 4%. Plans for effort in future intervals are given.
Author (GRA)

N74-18167# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
ADVANCED INTERDISCIPLINARY RESEARCH IN THE DEFENSE APPLICATIONS OF LABORATORY ASTROPHYSICS Final Report
A. V. Phelps and S. J. Smith Aug. 1973 40 p refs
(Contracts DA-31-124-ARO(D)-139; DAHC04-72-C-0047; ARPA Order 492)
(AD-771150; AROD-10827-8-P) Avail: NTIS CSCL 20/5

Contents: Modeling of ionized gas systems; Transport coefficients and reaction rates; Energy loss and radiation production by electron collisions; Generation and absorption of radiation. GRA

N74-18168# Calspan Corp., Buffalo, N.Y.
MIXING IN A SUBSONIC HF LASER Final Report, 1 Jul. 1972 - 30 Sep. 1973
Theodore J. Falk Nov. 1973 68 p refs
(Contract N00014-72-C-0461)
(AD-772126; CALSPAN-WG-5173-A-2) Avail: NTIS CSCL 20/5

The flow length required for mixing in a subsonic-flow CW chemical laser has been measured experimentally. The objectives of the mixing study were: (1) to determine the flow length required for mixing behind a bleed bar injector to aid in interpretation of kinetics and laser experiments; (2) to improve the mixing in such configurations and; (3) to demonstrate the effect of improved mixing on DF-CO2 laser performance. Flow conditions were selected which permitted the use of CO2 spontaneous emission as a mixing diagnostic. In a second phase of the program, the effects of various contaminants upon the performance of a DF-CO2 laser were measured. Laser efficiency was determined in the presence of COF2 contaminant with nitrogen and helium diluents and with CO contaminant with helium diluent. (Modified author abstract) GRA

N74-18169# General Electric Co., Philadelphia, Pa. Space Div.
COPPER VAPOR GENERATOR Final Report, Apr. 1972 - Mar. 1973
T. W. Karras, R. S. Anderson, B. G. Bricks, T. E. Buczacki, and L. S. Springer Nov. 1973 127 p refs
(Contract F29601-72-C-0079; ARPA Order 870; AF Proj. 0870)
(AD-771803; AFWL-TR-73-133) Avail: NTIS CSCL 20/5

The development of an efficient high flow velocity copper vapor generator, as a source for a copper vapor laser, is described. Generator operating times of several hours and copper densities within the laser cavity of the order of 10 to the 17th power atoms/cc are also reported. Copper vapor lasers have been operated with this source using both longitudinal and transverse discharges. Almost 0.1 j/l of laser excitation has been obtained at vapor densities of only 4 x 10 to the 14th power copper atoms/cc. This represents lasing more than 33 percent of the available copper atoms. GRA

N74-18170# Esso Research and Engineering Co., Linden, N.J.
EFFICIENT, LOW TEMPERATURE COPPER VAPOR GENERATOR Technical Report, May - Dec. 1972
Robert J. L. Chimenti Dec. 1973 57 p refs
(Contract F29601-72-C-0081; AF Proj. 3326)
(AD-771804; AFWL-TR-73-95) Avail: NTIS CSCL 20/5

The report presents the results of a 6-month program to develop a low temperature (-500C) copper vapor generator for use as a copper vapor laser. The generator concept investigated used the reported thermal instability of volatile copper chelates which were evaluated as a source of atomic copper vapor. Measurements of copper vapor density obtained from the dissociation of copper trifluoracetylacetonate (Cu(TFA)2) in these devices were made and the effect of the undecomposed molecules on the absorption of the atomic copper resonance radiation at 3274A and 3247A was determined. The principal conclusion is that the thermal decomposition of these molecules at temperatures below 500C cannot be used for a flowing copper vapor laser due to the low rate of homogeneous decomposition. (Modified author abstract) GRA

N74-18171# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
DISCOVERY OF NEW LASERS Final Technical Report, 1 Jan. - 28 Dec. 1973
Lawrence H. Hall 28 Dec. 1973 57 p refs
(Contract DAAH01-73-C-0447)
(AD-772001; R-9374; RK-CR-73-5) Avail: NTIS CSCL 20/5

The purpose of the investigation is to evaluate the potential of using electronically excited alkali metal atoms for a new chemical laser which would operate at wavelengths less than 2.2 micrometers. The study concentrated on the reaction of certain alkali metals (cesium and rubidium) with appropriate halogens (fluorine and chlorine). These reaction systems show promise of producing population inversions in the upper electronic states of the alkali metal atoms (based on their exothermicities and upon early work of Polanyi with the Na/Cl2 system). GRA

N74-18172# United Aircraft Corp., East Hartford, Conn. Research Labs.
HIGH POWER CO2 LASER DEVICES Final Report, 22 Feb. 1972 - 15 Jun. 1973
Robert J. Freiberg, Carl J. Buczek, Michael L. Skolnick, Peter P. Chenausky, and Arnold R. Clobes Nov. 1973 80 p refs
(Contract DAAB07-72-C-0124; DA Proj. 1S6-62703-A-056)
(AD-771995; ECOM-0124-F-72) Avail: NTIS CSCL 20/5

The report describes the investigations of frequency stable Q-switched CO2 laser oscillators. The characteristics of both free-running and injection-locked pulsed lasers are described. Optical heterodyne measurements of the frequency stability of the sources are presented. Author (GRA)

N74-18173# Hughes Research Labs., Malibu, Calif.
INVESTIGATION OF UV PHOTOIONIZATION SUSTAINED DISCHARGE FOR GAS LASERS Semiannual Technical Report, 2 Jan. - 30 Jun. 1973
Richard Lind and J. Y. Wada Dec. 1973 68 p
(Contract N00014-73-C-0287; ARPA Order 1807)
(AD-771437) Avail: NTIS CSCL 20/5

The objective of this program is to investigate and improve ultraviolet (UV) photoionization plasma conditioning techniques. The primary goals of the program are the demonstration of a UV sustained electrical discharge atmospheric pressure CO2 laser together with an understanding of the scalability limits of such a scheme. The dynamics of the plasma generation in the UV sustained scheme are similar to those of the electron beam

controlled discharge. The feature which makes the UV sustained scheme an attractive system to study is its simplicity of construction as opposed to that of the e-beam. (Modified author abstract) GRA

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-18174*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRETTING OF NICKEL-CHROMIUM-ALUMINUM ALLOYS AT TEMPERATURES TO 816 C
Robert C. Bill Washington Mar. 1974 22 p refs Prepared in cooperation with Army Air Mobility Res. and Develop. Lab., Cleveland
(NASA-TN-D-7570; E-7585) Avail: NTIS HC $3.00 CSCL 11/6

A series of four nickel-based alloys containing 10 percent and 20 percent chromium in combination with 2 percent and 5 percent aluminum were fretted in dry air at temperatures to 816 C. At all temperatures, the alloys showed far less fretting wear than did high-purity nickel. This was attributed to the formation of protective oxide films on the alloys, the result of the selective oxidation of the alloy constituents. Increasing the aluminum concentration reduced fretting wear at all temperatures. Increasing the chromium concentration from 10 percent to 20 percent resulted in decreased fretting wear at 23 and 540 C, but increased fretting wear at 650 and 816 C. Author

N74-18175*# Linguistic Systems, Inc., Cambridge, Mass.
EFFECTS OF SUPERPLASTICITY OF TITANIUM AND ITS ALLOYS AND THE USE OF THIS PHENOMENON IN WELDING IN THE SOLID STATE
M. Kh. Shorshorov, A. F. Tikhonov, and N. I. Nadirashvili Washington NASA Mar. 1974 15 p refs Transl. into ENGLISH from the publ. "Effekt Sverkhplastichnosti Titana i Ego Splavovi Ispolzovanie Etogo Yavleniya Pri Svarke v Tverdom Sostoyanii" Moscow, Nauka, 1973 p 140-145
(Contract NASw-2482)
(NASA-TT-F-15374) Avail: NTIS HC $4.00 CSCL 11F

Super plasticity of titanium and some of its alloys are discussed, as well as the possibility of using titanium for intensifying the process by which a compound is formed in the solid state. It was assumed that intensification in welding depends on the speed of the movement of structural defects, intergrain slip, and diffusion. The study was performed on the IMASH-5 S-65, a device for high temperature metallography with a chamber adapted for welding and dilatometric processes. Author

N74-18176*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORROSION OF OXYGEN-DOPED TANTALUM BY LITHIUM
Stephan Stecura Washington Mar. 1974 24 p refs
(NASA-TM-X-2989; E-7685) Avail: NTIS HC $3.00 CSCL 11F

The increase in the penetration of tantalum by liquid lithium with increasing oxygen content of tantalum results from the ability of lithium to extract oxygen from tantalum oxides, regions of high oxygen concentrations, or both, and accompanied by the creation of minute channels. At low oxygen concentrations, oxides are present primarily at the grain boundaries, and the lithium penetration is primarily intergranular. At higher oxygen concentrations, oxides and regions of high oxygen concentration are present both at grain boundaries and within the grains; the lithium penetration is both intergranular and intragranular. For a specific oxygen concentration the severity of corrosion decreases with increasing temperature because: (1) the oxygen solubility increases with temperature, decreasing the number of oxide particles and/or regions of high oxygen concentration; and (2) the diffusivity of oxygen in tantalum increases, allowing more rapid oxygen removal at the tantalum-lithium interface. Author

N74-18177# Oak Ridge National Lab., Tenn.
PRECISION MEASUREMENTS OF THE THERMAL CONDUCTIVITY, ELECTRICAL RESISTIVITY, AND SEEBECK COEFFICIENT FROM 80 TO 400 K AND THEIR APPLICATION TO PURE MOLYBDENUM
J. P. Moore, R. K. Williams, and R. S. Graves 1973 38 p refs Presented at the 13th Intern. Conf. on Thermal Conductivity, Lake Ozark, Mo., 5 Nov. 1973 Sponsored by AEC
(Conf-731106-1) Avail: NTIS HC $4.00

A longitudinal heat flow technique for precise measurement of thermal conductivity, electrical resistivity, and Seebeck coefficient over the temperature range from 80 to 400 K is described. The basis of the technique is the use of a calibrated platinum resistance thermometer to provide in-situ calibrations of specimen thermocouples. The total determinate errors at 273 K are + or - 0.23% for electrical resistivity, + or - 0.49% for thermal conductivity, and + or - 0.07 microvolt/K for the Seebeck coefficient when Pt wire is used as the reference. Experimental results on two high purity molybdenum specimens with cross-sectional areas differing by a factor of four are presented to demonstrate the system precision and low level of indeterminate errors. Author (NSA)

N74-18178# Explosives Research and Development Establishment, Waltham Abbey (England).
AN INVESTIGATION INTO THE INFLUENCE OF SURFACE PRE-TREATMENT BY PARTICLE IMPACT ON THE STRENGTH OF ADHESIVE JOINTS BETWEEN LIKE STEEL SURFACES
R. W. Atkins, L. Greenwood, and T. J. Punter (Vacu-Blast Ltd., Slough, Engl.) Jan. 1973 20 p
(ERDE-TR-120; BR37457) Avail: NTIS HC $4.00

The effect of particle impact surface pretreatment (grit blasting) on the bonding of steel surfaces using a structural adhesive was studied. Mild steel and stainless steel cylinders were prepared for bonding by eighteen different methods of grit blasting and three methods of chemical pretreatment. The cylinders were then bonded by two coaxially, using an epoxy film adhesive cured at 100 to 108 C. The influence of different abrasive powders, nozzle pressures, and angles of incidence between the jet and the adherend surface, on the joint strengths produced, was measured by stressing the joints in shear and in tension. Author (ESRO)

N74-18179# Oxford Univ. (England). Lab. of Engineering.
THE EFFECT OF TEMPERATURE AND STRAIN RATE ON THE STRENGTH AND DUCTILITY OF FIVE ALLOY STEELS Interim Report
J. Harding Mar. 1973 49 p refs
(Contract N/CP/75/52575/65/SC334)
(Rept-1057/73; IR-6) Avail: NTIS HC $5.50

Tensile stress-strain curves are presented for BS.968 and HY.80 steels, tested at 225 K and 77 K, and for QT.35 and HY.100 steels, tested at 77 K, at mean plastic strain rates from 0.003 to 2500/s. At each temperature the effect of strain rate on the flow stress at 2.5% plastic strain and on the elongation to fracture is determined. Stress-strain curves are also presented for tests at strain rates of 0.003 and 2500/s on specimens of BS.968 and UXW steels at several temperatures in the range 288 - 77 K and the effect of temperature on the flow stress at 2.5% plastic strain and on the fracture elongation determined. A comparison is made between the present results and those of an earlier investigation at room temperature. At high strain rates and low temperatures only a slight reduction is found in the rate sensitivity of the flow stress compared with that at room temperature. Author (ESRO)

N74-18180# Brown Univ., Providence, R.I. Dept. of Engineering.
PLASTIC DEFORMATION OF METALS AT HIGH STRAIN RATES. PART 1: THE EFFECTS OF TEMPERATURE ON THE STATIC AND DYNAMIC STRESS-STRAIN CHARACTERISTICS IN TORSION OF 1100-0 ALUMINUM Summary Report, Feb. 1972 - Mar. 1973
A. M. Eleiche and J. Duffy Jul. 1973 77 p refs

(Contract F33615-71-C-1308; AF Proj. 7353)
(AD-770189; AFML-TR-73-105-Pt-1) Avail: NTIS CSCL 11/6

A series of tests is described in which tubular specimens of a commercially pure polycrystalline aluminum were loaded in torsion up to shear strains of about 2 and 4% respectively, over the temperature range -180C to 250C. The experimental results give the flow stress in shear, the strain and the strain rate against time. They also give stress-strain curves which are compared to the corrresponding static curves obtained by testing similar specimens in torsion at about 0.001/sec. A graph showing the dependence of flow stress on temperature indicates that there are three different temperature ranges for polycrystalline aluminum within each of which a different deformation mechanism presumably dominates the flow process. (Modified author abstract) GRA

N74-18181# Battelle Columbus Labs., Ohio. Metals and Ceramics Information Center.
PROCEEDINGS OF THE 1972 TRI-SERVICE CONFERENCE ON CORROSION
Murray M. Jacobson and Anthony Gallaccio Dec. 1973 388 p refs Conf. held in Houston, Tex., 5-7 Dec. 1972
(Contract DSA900-74-C-0616)
(AD-771345; MCIC-73-19) Avail: NTIS CSCL 11/6

Contents: High temperature oxidation and sulfidation; Corrosion-induced cracking phenomena; Special topics; Aircraft and missiles; Power units; Armaments; Ships, submersibles and ocean equipment; Electronic equipment. GRA

N74-18182# General Motors Corp., Indianapolis, Ind. Detroit Diesel Allison Div.
ENGINEERING EVALUATION OF THE PRE-STRESS/SURFACE REMOVAL TECHNIQUE FOR FATIGUE OR CREEP ENHANCEMENT Final Report, 14 Jun. 1972 - 14 Jun. 1973
G. R. Sippel, M. Herman, and E. S. Nichols Aug. 1973 43 p refs
(Contract N00019-72-C-0458)
(AD-771383; DDA-EDR-7862) Avail: NTIS CSCL 11/6

Compressor blades of annealed Ti 6Al-4V alloy were step fatigue tested in the fundamental mode to determine the effect of a prestress-surface removal treatment on the 10 to the seventh power cycle fatigue strength. Prestressing the blades in axial tension at 80-100 ksi and stress relaxing at ambient temperature, improved the average 10 to the seventh power cycle fatigue strength up to 60%. Residual surface stresses on the blades, measured before and after prestressing, showed a residual compressive stress due to prestressing. Glass bead peening failed tc improve the annealed blade fatigue strength. Practical methods for prestressing blades must be developed for production application of this process. The prestress-surface stress removal treatment was not effective in reducing the secondary creep rate of cast nickel base MAR-M246 alloy material at realistic turbine blade temperatures and stresses. Author (GRA)

N74-18183# Dow Chemical Co., Midland, Mich.
MAGNESIUM-YTTRIUM ALLOYS, SCALE-UP AND EVALUATION Final Report
Bruce C. Peters and Sidney L. Couling Apr. 1973 97 p refs
(Contract DAAG11-69-C-0626)
(AD-771039) Avail: NTIS CSCL 11/6

A magnesium alloy containing 9% yttrium, 1% zinc, and 0.5% zirconium was produced in the form of sheet and extrusions on production equipment and the resulting materials were then evaluated for structural performance. The measured room temperature strength properties of the sheet and extrusions were very high for a magnesium alloy. It was demonstrated that the sheet and extrusions can be fabricated into structural shapes and assemblies without undue difficulty. The projection was confirmed of a 21% weight reduction for a helicopter tail cone by switching certain components from aluminum to magnesium. The magnesium-yttrium panels, however, when tested to fracture, demonstrated little warning of impending rupture and it was concluded that this material was not acceptable for use in primary aircraft structures. (Modified author abstract) GRA

N74-18184# Naval Ship Research and Development Center, Annapolis, Md.
THE RELATIONSHIP BETWEEN MICROSTRUCTURE, ALLOY CONTENT, AND MECHANICAL PROPERTIES IN BINARY TITANIUM ALLOY SYSTEMS
Ivan L. Caplan Nov. 1973 81 p refs
(ZR0000101)
(AD-771369; NSRDC-4183) Avail: NTIS CSCL 11/6

An investigation has been conducted on binary alloys of titanium-nickel and titanium-molybdenum. Research size ingots were electron-beam melted and processed. The change in microstructure as affected by heat treatment and alloy content is discussed. Tensile and Charpy impact tests were used to compare structure with mechanical properties. Generally, in the systems investigated, strength increases and toughness decreases with alloy content. Author (GRA)

N74-18185# Naval Research Lab., Washington, D.C.
STUDY OF A TITANIUM WIRE ROPE DEVELOPED FOR MARINE APPLICATIONS Final Report
Darrell A. Milburn 2 Nov. 1973 24 p refs
(RR0230345)
(AD-771355; NRL-7625) Avail: NTIS CSCL 11/6

The mechanical properties and fatigue performance of a titanium wire rope have been experimentally determined. The rope has a nominal diameter of 1/4-in. and is of 7 x 7 structural form. Other salient constructional details of the rope include the use of two titanium alloys and two wire lubricants. Furthermore, lay lengths of the rope and of individual strands were increased over those for similarly constructed steel ropes. The overall test program consisted of two major parts: static tensile tests and acial fatigue tests. For purposes of comparison, stainless-steel and galvanized-steel wire ropes of the same nominal diameter and 7 x 7 form were also subjected to these tests. Test results indicate that the strength-to-weight ratio and stretch characteristics of the titanium rope are superior to those of the steel ropes. However, the fatigue-life data suggest that it would fail as a part of a marine structure in a significantly shorter period of time than would either of the two less expensive steel ropes. (Modified author abstract) GRA

N74-18186# Dayton Univ. Research Inst., Ohio.
INVESTIGATION OF ENERGY-ABSORBING MECHANISMS IN THE IMPACT BEHAVIOR AND RAIN EROSION RESISTANCE OF PURE NICKEL Summary Technical Report, Sep. 1972 - Jun. 1973
Olive G. Engel Aug. 1973 56 p refs
(Contract F33615-72-C-1620; AF Proj. 7340)
(AD-771027; AFML-TR-73-206) Avail: NTIS CSCL 11/6

The impact behavior of pure nickel 270 at velocities of 100 to 432 feet per second with nylon sphere impact and the rain erosion resistance at velocities of 100-1100 feet per second in one inch hour rainfall were investigated to determine the mechanisms whereby nickel absorbs the energy of the impacts and thereby possesses good erosion resistance. The reduction in slope of the crater-depth-versus-velocity curve for steel-sphere impacts against nickel, which occurs at velocities from 200 to 210 ft/sec, is a real effect. This unusual feature in the cratering behavior of nickel cannot be ascribed to plastic flow and/or work-hardening of the nickel. Results of this study suggest that it may be ascribed to the operation of an energy sink in the nickel and that, on the basis of energy considerations, this sink may be the magnetic transition. Author (GRA)

N74-18187# British Steel Corp., Sheffield (England). Information Services.
APPARATUS FOR STUDYING ATMOSPHERIC DEGRADATION OF MATERIALS
K. E. Johnson and A. F. Bromley Oct. 1973 12 p refs
(PB-225717/8GA; CEL/CH/34/73) Avail: NTIS HC $3.00 CSCL 11F

A simple, flexible test facility has been devised which is suitable for examining the effects of trace gases on the degradation of materials under conditions approximating to those of free atmospheric exposure. Author (GRA)

N74-18188# Naval Research Lab., Washington, D.C.
THE EFFECT OF MERCURY AND TIN FROM ALUMINUM

GALVANIC ANODES ON THE CORROSION CHARACTERISTICS OF 5086-H34 AND 6061-T6 ALUMINUM Final Report
T. J. Lennox, Jr., R. E. Groover, and M. H. Peterson 16 Nov. 1973 31 p refs
(SF51542602)
(AD-771719; NRL-7648) Avail: NTIS CSCL 11/6

Corrosion behavior studies were conducted in seawater for 696 days. There were no indications that corrosion products from either the Al-Hg-Zn or the Al-Sn-Zn galvanic anodes caused increased corrosion. Neither Hg nor Sn was found, by electron microprobe analysis, at corroded areas. The electron microprobe did reveal that the most severe localized corrosion occurred where copper, the source of which was unknown, had redeposited on the structural aluminum specimens. Cathodic protection from either the Al-Hg-Zn or the Al-Sn-Zn anodes virtually eliminated corrosion on the 5086-H34 and 6061-T6 aluminum specimens that were either continuously or alternately immersed in seawater, except for slight corrosion under some of the anodes. As expected, cathodic protection was only partially effective when it was provided for only the first 186 days of the 696 days of exposure. The slight corrosion and the buildup of bulky corrosion products between the anodes and the specimens confirmed the advisability of using some type of a barrier, such as zinc oxide paste or an organic coating, between aluminum anodes and the structure on which they are mounted. (Modified author abstract) GRA

N74-18189# Army Materials and Mechanics Research Center, Watertown, Mass.
ON THE HIGH TEMPERATURE DEFORMATION OF TITANINUM-ALUMINUM ALLOYS Final Report
Robert D. French Oct. 1973 18 p refs
(DA Proj. 1T0-61102-B-32A)
(AD-771916; AMMRC-TR-73-45) Avail: NTIS CSCL 11/6

A study of high temperature deformation in the titanium-aluminum binary system was undertaken to support the development of titanium alloys for use over the temperature range 900F to 1200F. Specimens containing four, five, six, eight and ten weight % aluminum were creep tested to compare single-phase material with an alloy containing a second phase, Ti3Al. The starting material is shown to have a strong texture which is related to a reduction in the difference in critical resolved shear stress between the basal and prismatic planes. Creep testing revealed that the activation energy for steady state creep is a function of stress and aluminum content over the temperature range of 900F to 1400F but was inconclusive in identifying the principal mode of deformation. Author (GRA)

N74-18190# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
CORRELATION OF MICROSTRUCTURES WITH FRACTURE TOUGHNESS PROPERTIES IN METALS Final Report, 1 Jun. 1972 - 30 Sep. 1973
Frank A. Crossley and Richard E. Lewis 30 Sep. 1973 132 p refs
(Contract N00019-72-C-0545)
(AD-772103; LMSC-D356114) Avail: NTIS CSCL 11/6

Ti-6Al-4V alloy was studied in three mill product forms for the purpose of establishing a correlation between microstructure and fracture toughness. Tension test, fracture toughness, and crack growth rate properties were determined. Light microscopy, scanning electron microfractography, and transmission electron microscopy were the metallographic means employed. A key factor in the microstructural and fracture toughness differences is cooling rate. The fatigue crack propagation rate was found to vary widely among the different microstructures. There was some correlation between microfractographic modes and fracture toughness. (Modified author abstract) GRA

N74-18191# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ATTENTION: LIQUID ALUMINUM
S. Kalinchev 10 Dec. 1973 10 p Transl. into ENGLISH from Znanie-Sila (USSR), no. 11, 1972 p 18-19
(AD-772056; FTD-HT-23-811-74) Avail: NTIS CSCL 11/6

The paper describes the casting of aluminum in which magnetohydrodynamic apparatus is used. GRA

N74-18568 Joint Publications Research Service, Arlington, Va.
PLASMA PROCESSES IN METALLURGY AND THE TECHNOLOGY OF INORGANIC MATERIALS
In its Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 1-7 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 3-7
(For availability see N74-18567 09-34)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-18192*# Allied Chemical Corp., Morristown, N.J. Plastics Div.
FLAME RESISTANT FIBROUS MATERIALS
[1973] 69 p refs
(Contract NAS9-12257)
(NASA-CR-134062) Avail: NTIS HC $6.50 CSCL 11D

Four chlorofluoropolymer systems were developed that satisfactorily met the criteria for classification as self-extinguishing. Three of these systems consisted of Halar (a copolymer of chlorotrifluoroethylene and ethylene) and tin-based flame retardants. The fourth system was a copolymer of chlorotrifluoroethylene and tetrafluoroethylene with no flame retardants added. Production of fibers from all four candidates, by melt extrusion, was demonstrated. Fibers produced from the chlorotrifluoroethylene tetrafluoroethylene copolymer showed the most promise. Author

N74-18193*# TRW Systems, Redondo Beach, Calif.
FILAMENT WINDING S-GLASS/POLYIMIDE RESIN COMPOSITE PROCESSING STUDIES Final Report, 29 Jun. 1972 - 30 Sep. 1973
R. W. Vaughan and R. J. Jones Feb. 1974 50 p refs
(Contract NAS3-16760)
(NASA-CR-134590; TRW-22816-6014-TU-00) Avail: NTIS HC $5.50 CSCL 11D

The work performed in selecting a TRW A-type polyimide resin that would be suitable for fabrication of filament wound reinforced plastic structures is described. Several different formulations were evaluated after which the P105AC formulation was selected as the most promising. Procedures then were developed for preparing P105AC/S-glass roving prepreg and for fabricating filament wound structural composites. Composites were fabricated and then tested in order to obtain tensile and shear strength information. Small, closed-end cylindrical pressure vessels then were fabricated using a stainless steel liner and end fittings with a P105AC/S-glass polar wound overwrap. These pressure vessels were cured in an air circulating oven without augmented pressure. It is concluded that the P105AC resin system is suitable for filament winding; that low void content, high strength composites are obtained by the filament winding process; and that augmented pressure is not required to effect the fabrication of filament wound P105AC composites. Author

N74-18194# RAND Corp., Santa Monica, Calif.
PETROLEUM: A PREDICTION MADE IN 1950
James H. Hayes Dec. 1973 11 p refs
(P-5135) Avail: NTIS HC $4.00 CSCL 11H

An outline of the world petroleum situation as it relates to the United States is presented. The various geographical areas where petroleum is found are examined with emphasis on the longevity of the sources as well as how political situations affect the accessibility of the sources. The need for replacing inaccessible sources by alternate sources and synthetic processes is examined. S.K.W.

N74-18195*# General Electric Co., Philadelphia, Pa. Space Sciences Lab.
BASIC FAILURE MECHANISMS IN ADVANCED COMPOSITES Final Report, 3 Apr. 1972 - 3 Jun. 1973
V. F. Mazzio, R. L. Mehan, and J. V. Mullin 3 Jun. 1973

101 p refs
(Contract NAS3-15835)
(NASA-CR-134525) Avail: NTIS HC $8.25 CSCL 11D

The fundamental failure mechanisms which result from the interaction of thermal cycling and mechanical loading of carbon-epoxy composites were studied. This work was confined to epoxy resin unidirectionally reinforced with HTS carbon fibers, and consists of first identifying local fiber, matrix and interface failure mechanisms using the model composite specimen containing a small number of fibers so that optical techniques can be used for characterization. After the local fracture process has been established for both mechanical loading and thermal cycling, engineering composite properties and gross fracture modes are then examined to determine how the local events contribute to real composite performance. Flexural strength in high fiber content specimens shows an increase in strength with increased thermal cycling. Similar behavior is noted for 25 v/o material up to 200 cycles; however, there is a drastic reduction after 200 cycles indicating a major loss of integrity probably through the accumulation of local cleavage cracks in the tensile region.
Author

N74-18196*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF COATINGS TO CONTROL ELECTRO-OSMOSIS IN ZERO GRAVITY ELECTROPHORESIS
A. C. Krupnick 14 Feb. 1974 18 p refs
(NASA-TM-X-64807) Avail: NTIS HC $4.00 CSCL 11C

A major problem confronting the operation of free fluid electrophoresis in zero gravity is the control of electrokinetic phenomena and, in particular, electroosmosis. Due to the severity of counter flow, as a result of electroosmosis, the electrical potential developed at the surface of shear must be maintained at near, or as close to, zero millivolts as possible. Based upon this investigation, it has been found that the amount of bound water or the degree of hydroxylation plays a major role in the control of this phenomena. Of necessity, factors, such as adhesion, biocompatibility, protein adsorption, and insolubility were considered in this investigation because of the long buffer-coating exposure times required by present space operations. Based upon tests employing microcapillary electrophoresis, it has been found that gamma amino propyl trihydroxysilane produced a coating which provides the lowest potential (minus 3.86 mv) at the surface of shear between the stationary and mobile layers. This coating has been soaked in both borate and saline buffers, up to three months, in a pH range of 6.5 to 10 without deleterious effects or a change in its ability to control electrokinetic effects.
Author

N74-18197*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DUPLEX ALUMINIZED COATINGS Patent Application
Michael A. Gedwill and Salvatore J. Grisaffe, inventors (to NASA) Filed 24 Jan. 1974 9 p
(NASA-Case-LEW-11696-2; US-Patent-Appl-SN-436315) Avail: NTIS HC $4.00 CSCL 11C

Coated metallic base systems are described with particular attention to oxidation-resistant alloy overlay coatings and claddings on superalloys and dispersion-strengthened alloys. A ductile, oxidation-resistant metallic alloy layer covers the surface of a superalloy substrate. This layer is achieved by foil cladding, physical vapor deposition, ion plating, sputtering, plasma spraying or slurry sintering. The chemistry of the overlay layer is such that the oxidation resistance of the subsequently aluminized outermost layer is not seriously degraded. The aluminide outer layer can be developed by pack cementation, metallizing, dipping, spraying, physical vapor deposition, ion plating, sputtering, or electrophoresis.
NASA

N74-18198# Sandia Labs., Albuquerque, N.Mex.
HYDROGEN EVOLUTION FROM ADHESIVES
N. J. DeLollis May 1973 13 p ref Presented at ASTM Comm. D-14 Meeting, Denver, 17 Oct. 1973 Sponsored by AEC
(SLA-73-5517; Conf-731019-1) Avail: NTIS HC $3.00

Aluminum is presented in Sandia systems in the form of aluminum powder filler for adhesives and in aluminum alloy components. Both react with water to produce hydrogen. Platinized charcoal is shown to be an effective getter to remove hydrogen from a closed environment.
Author (NSA)

N74-18199# Sandia Labs., Albuquerque, N.Mex.
EFFECT OF CRACK LENGTH AND BOND STRENGTH ON THE DELAMINATION PROCESS IN BORSIC-Al COMPOSITES
W. R. Hoover and R. E. Allred Sep. 1973 21 p refs
(Contract AT(29-1)-789)
(SLA-73-911) Avail: NTIS HC $3.25

The effect of crack length and fiber-matrix bond strength on the delamination process in unidirectional Borsic-Al composites has been examined using Single-Edge-Notch specimens. The transverse tensile strength, was used as an indirect measure of the fiber-matrix bond strength, which was altered through variations in hot pressing during composite fabrication. In composites with weak fiber-matrix bonds, the net-section stress at delamination, was observed to decrease with increasing crack length. Variations in crack length did not significantly alter the basic fracture mechanism in which the delamination process led to notch insensitivity. Through the use of crossplied composites, the transverse strength was raised to 16.6 ksi and delamination was suppressed. This led to notch-sensitive fracture behavior and a substantial decrease in the fracture toughness compared with the composites which delaminated prior to failure.
Author (NSA)

N74-18200# Atomic Energy of Canada Ltd., Chalk River (Ontario).
MATERIALS RESEARCH IN ATOMIC ENERGY OF CANADA LIMITED, SUMMER 1973
[1973] 25 p refs
(AECL-4517) Avajl: AEC Depository Libraries; HC$3.25 Atomic Energy of Can., Ltd., Chalk River: $1.00

The review covers the electron microscopy of ceramic materials (ion milling and radioinduced defects in SiC); computer analysis of transmission electronic diffraction (ZrO_2); diffusion, phase formation, and bonding of soft Ni to hard Ti; hydriding of zirconium/steel roiled joints; nondestructive testing of nuclear fuel; and contact stresses, deformation, and wear (of oxidized Zr and Zircaloy-2 in water).
NSA

N74-18201# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires
STUDY OF DEFECTS INDUCED BY PHOSPHORUS DIFFUSION IN SILICON. CORRELATIONS WITH SOME ELECTRICAL PARAMETERS OF DEVICE Ph.D. Thesis - Univ. Sci. et Med. de Grenoble
Patrick Mortini Oct. 1973 116 p refs In FRENCH
(CEA-R-4464) Avail: AEC Depository Libraries HC $8.00

Structural defects and electrical parameter degradation of planar silicon diodes and the large ring diodes of MOS devices are investigated. A description is given of the possibilities offered by the methods of transmission analysis by electron microscopy, chemical revelation, and X-ray analysis of device topography. Special attention was given to defects and degradation caused by phosphorus diffusion in silicon.
Transl. by E.H.W.

N74-18202# Battelle-Northwest, Richland, Wash. Pacific Northwest Labs.
PROJECTION OF GRAPHITE BEHAVIOR IN THE UNIVERSITY OF WISCONSIN TOKAMAK (AUSTIN DESIGN)
W. J. Gray and W. C. Morgan Jun. 1973 40 p refs
(Contract AT(45-1)-1830)
(BNWL-B-288) Avail: NTIS HC $4.00

An estimate was made of graphite performance. The neutron spectra in the graphite for this design were related to the equivalent fission fluence for damage in graphite using group average displacement cross sections of the atomic displacement weighting function. Graphite temperatures were calculated using heat generation rates. Dimensional changes were determined for the Wisconsin reactor using data for type NC8 graphite. The neutron flux in the graphite region is relatively low. As a result, NC8 graphite, which is a typical nuclear graphite, could be expected to last more than 6900 full power operating days based on considerations of unstressed dimensional changes. Internal stresses due to the flux gradient in the graphite could reduce this lifetime somewhat. Graphite was shown to be considerably

better than lithium for fast neutron attenuation; therefore the lithium blanket should be reduced to the minimum thickness required for tritium breeding, and graphite be used for neutron moderation. Author (NSA)

N74-18203# Battelle-Northwest, Richland, Wash. Pacific Northwest Labs.
PROJECTION OF GRAPHITE BEHAVIOR IN THE LASL REFERENCE THETA PINCH REACTOR
W. J. Gray and W. C. Morgan Jun. 1973 35 p refs
(Contract AT(45-1)-1830)
(BNWL-B-289) Avail: NTIS HC $4.00

An estimate is made of the graphite performance in the LASL Reference Theta Pinch Reactor (RTPR) described by Burnett et al and by Dudziak. The neutron spectra in the graphite for this design provided by Dudziak were related to the equivalent fission fluence for damage in graphite using group average displacement cross sections provided by Jenkins who used, in turn, the Thompson and Wright form of the atomic displacement weighting function. Graphite temperatures were calculated using heat generation rates supplied by Dudziak of LASL. Dimensional changes were determined for the RTPR using data for types NC8 and 9640 grahites. The calculated neutron fluences are quite high in the graphite region of the RTPR. As a result, dimensional changes in the graphite will occur rather rapidly such that the lifetime of the graphite will probably be limited to something less than 300 full power days. NSA

N74-18204# Shell Research, Ltd., Egham (England).
CARBON FIBRE REINFORCED EPOXIDE RESINS
G. T. Merrall, J. C. Whittle, and R. R. Stolton London Min. of Defence Apr. 1973 145 p refs
(Contract KS/1/0553/C.B.43(a)2)
(D-Mat-189; BR33009) Avail: NTIS HC $10.25

Studies on epoxide resin systems in combination with carbon fiber reinforcement were made. The desired resin properties included suitability for making preimpregnated fiber with a shelf life of six months and acceptable mechanical properties when cured under appropriate conditions of temperature and pressure. Epikote 0201 Epikote 1031/NMA, postcured, gave composites which maintained their elevated temperature performance (short term) most satisfactorily, as indicated by flexural testing. Epikote 0201NMA, post cured, gave composites having better water resistance properties, judged by both weight change measurements and maintainance of flexural properties. ESRO

N74-18205# Watervliet Arsenal, N.Y.
STRESS CONCENTRATION FACTORS OF SOME FIBER-REINFORCED COMPOSITE STRIPS CONTAINING A HOLE UNDER TENSION OR BENDING
Y. F. Cheng Oct. 1973 49 p refs
(DA Proj. 1T0-62105-A-349)
(AD-771055; R-WV-T-6-41-73) Avail: NTIS CSCL 11/4

Factors of stress concentration were determined, experimentally and analytically, for boron-aluminum, boron-epoxy and fiberglass-epoxy composite material strips containing a hole under tension or bending. In total, ten combinations of constituent modulus ratio, lamina orientation and fiber volume fraction, and three values of hole diameter to strip width ratio were investigated. Experimental values were obtained by means of electric resistance foil strain gages, and analytical results from the NASTRAN finite element analysis. It appears that stress concentration could be minimized by employing angle ply instead of uniaxial or cross-ply, by reducing constituent modulus ratio, and by adjusting fiber volume fraction. Further work is necessary in order to optimize these parameters. Author (GRA)

N74-18206# Monsanto Research Corp., St. Louis, Mo.
THE EFFECT OF PRESTRAIN AND WATER SOAK ON THE MECHANICAL PERFORMANCE OF CROSSPLIED COMPOSITES
M. J. Michno, Jr. and R. E. Lavengood Oct. 1973 29 p refs
(Contract N00014-67-C-0218; ARPA Order 876;
NR Proj. 356-484)
(AD-770623; HPC-73-154) Avail: NTIS CSCL 11/4

The mechanical performance of 0 degree - 90 degree crossplied glass-epoxy laminates was evaluated under static tensile loading along the longitudinal direction. The effects of both prestraining and water soaking were considered. Generally, the stress and strain associated with initial cracking increased with prestrain even in the presence of water. The ultimate stress and strain continuously decreased. However, under the most adverse conditions considered (greatest prestrain and water soak) this decrease was less than 20 percent. It is concluded that a reasonable static design limit stress would be 2/3 the ultimate tensile stress. Author (GRA)

N74-18207# Michigan Univ., Ann Arbor. Dept. of Materials and Metallurgical Engineering.
REPORT OF THE MATERIALS RESEARCH COUNCIL (1973)
Edward E. Hucke Dec. 1973 108 p refs
(Contract DAHC15-71-C-0253; ARPA Order 2341)
(AD-771302) Avail: NTIS CSCL 11/9

The report provides a summary of the activities and output of the Materials Research Council for the year ending December, 1973. Research topics include superconductors, crystals, mechanical properties of materials, energy transfer, solar energy, high temperature research, and other areas. GRA

N74-18208# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INSTRUMENTS AND METHODS OF RESEARCHING FRICTION AND WEAR (CHAPTER 7)
G. M. Bartenev and V. V. Lavrentev 12 Nov. 1973 50 p refs Transl. into ENGLISH from the book "Trenie i Iznos Polimerov" USSR, 1972 p 202-240
(AD-771604; FTD-MT-24-717-73) Avail: NTIS CSCL 11/9

In accordance with the general classification proposed by Mooney all polymer testing methods can be subdivided into three groups: scientific, service and mixed. In the case of frictional tests, according to Kragel'skiy, laboratory tests are classified as small-sample tests, laboratory tests of full-scale samples, and tests under operational conditions. The paper is dedicated to scientific tests. GRA

N74-18209# Plastics Technical Evaluation Center, Dover, N.J.
GOVERNMENT SPECIFICATIONS AND STANDARDS FOR PLASTICS, COVERING DEFENSE ENGINEERING MATERIALS AND APPLICATIONS Final Report
Norman E. Beach May 1973 16 p Revised Supersedes PLASTEC-N6B
(AD-771008; PLASTEC-N6C; PLASTEC-N6B) Avail: NTIS CSCL 11/9

The report lists the specifications for those plastic materials which are considered to be of interest to engineers concerned with the design, development, production, and handling of defense hardware. Included are the major specifications pertaining to adhesives, resins, molding, extrusion, films, foams, and laminates: sheets, rods, tubes and shapes. MIL, Federal, ASTM, and SAE Aeronautical Material Specifications are included. Author (GRA)

N74-18210# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
DEVELOPMENT OF DESIGN AND ANALYTICAL TECHNIQUES FOR ADVANCED COMPOSITE AIRCRAFT STRUCTURES. VOLUME 2: A SYNTHESIS PROCEDURE FOR MECHANICALLY FASTENED JOINTS IN ADVANCED COMPOSITE MATERIALS Final report, 1 Nov. 1971 - 31 Aug. 1973
J. P. Waszczak and T. A. Cruse Sep. 1973 203 p refs
(Contract F33615-72-C-1214; AF Proj. 6169CW)
(AD-771795; SM-73-11; AFML-TR-73-145-Vol-2) Avail: NTIS CSCL 11/4

The purpose of the study was to provide the composites designer with an automated preliminary design capability for weight minimized mechanically fastened joints and to identify the common characteristics of such minimum weight designs. The problem of a single column of fasteners loaded in simple tension is considered. The main plate can be made of either graphite-epoxy or boron-epoxy and is loaded by double shear metal splice plates. Independent linear variations in plate widths and thicknesses, including individual play orientation thicknesses, are permissible along the length of the joint. (Modified author abstract) GRA

N74-18211# Avco Corp., Wilmington, Mass. Government Products Div.
DEVELOPMENT AND APPLICATION OF NONDESTRUCTIVE METHODS FOR PREDICTING MECHANICAL PROPERTIES OF ADVANCED REINFORCED NONMETALLIC COMPOSITES Final Technical Report, 1 Jun. 1970 - 30 May 1973
C. H. Hastings, E. F. Olster, and S. A. Lopilato Wright-Patterson AFB, Ohio AFML May 1973 93 p refs
(Contract F33615-70-C-1526; AF Proj. 7351)
(AD-771774; AVSD-0183-73-CR; AFML-TR-73-157) Avail: NTIS CSCL 11/4

The report concerns itself with a detailed evaluation and development of ultrasonic interval velocity measurement technique. Results indicate that it is a practical and powerful tool applicable to the evaluation of boron/epoxy laminates for structural hardware components. Best results were achieved in the 0 degree and 90 degree directions of the laminates studied. Unbalanced laminates lead to greater errors in the 45 degree direction. Measurements off-angle with respect to reinforcing filaments do not now seem to be reliable. Based on interval velocity measurements, correlations were developed for modulus calculation and tensile strength prediction. (Modified author abstract) GRA

N74-18212# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
A STUDY OF FRACTURE PHENOMENA IN FIBER COMPOSITE LAMINATES, VOLUME 3 Final Report, 1 Nov. 1971 - 31 Aug. 1973
H. J. Konish, Jr. and T. A. Cruse Sep. 1973 128 p refs
(Contract F33615-72-C-1214; AF Proj. 6169)
(AFML-TR-73-145-Vol-3; AD-771796; SM-73-13) Avail: NTIS CSCL 11/4

The extension of linear elastic fracture mechanics from ostensibly homogeneous isotropic metallic alloys to heterogeneous anisotropic advanced fiber composites is considered. It is analytically demonstrated that the effects of material anisotropy do not alter the principal characteristics exhibited by a crack in an isotropic material. The heterogeneity of fiber composites is experimentally shown to have a negligible effect on the behavior of a sufficiently long crack. A method is proposed for predicting the fracture strengths of a large class of composite laminates; the values predicted by this method show good agreement with limited experimental data. The limits imposed by material heterogeneity are briefly discussed, and areas for further study are recommended. Author (GRA)

N74-18213# Martin Marietta Labs., Baltimore, Md.
CHEMOMECHANICAL CONTROL OF SLIDING FRICTION BEHAVIOR IN NONMETALS
N. H. Macmillan, R. D. Huntington, and A. R. C. Westwood Nov. 1973 33 p refs Submitted for publication
(Contract N00014-70-C-0330; NR Proj. 032-524)
(AD-771449; MML-TR-73-16C; TR-9) Avail: NTIS CSCL 11/2

Recent work has shown that surface active environments can be used to significantly and predictably influence the near-surface flow behavior (i.e., hardness) of such solids as magnesium oxide, calcite, alumina, quartz and soda-lime (s.l.) glass. Specifically, these solids are hardest in environments in which their zeta-potential is approximately zero. The results of the present study demonstrate that such chemomechanical effects can, under certain conditions, also be used to affect and control sliding friction behavior. In particular, it is shown that for magnesium oxide and s.l. glass in various environments the coefficient of friction mu(f) is a minimum when zeta approximately equals zero. This and other results are described, and some mechanistic and practical implications discussed. Author (GRA)

N74-18214# Army Materials and Mechanics Research Center, Watertown, Mass.
HOT PRESSING AND MECHANICAL PROPERTIES OF CALCIUM HEXABORIDE Final Report
Sunil K. Dutta Nov. 1973 12 p refs Presented at the Ann. Meeting of the Am. Ceramic Soc. (75th), Cincinnati, 29 Apr. - 3 May 1973
(DA Proj. 1T1-62105-A-330)
(AD-771921; AMMRC-TR-73-48) Avail: NTIS CSCL 11/2

Lightweight, high modulus calcium hexaboride was hot pressed to essentially theoretical density at a temperature of 1600 plus or minus 15C and a pressure of 6000 psi. Densification behavior was studied as a function of hot-pressing temperature for process characterization. The microstructure consisted of a CaB6 phase with a minor amount of free boron. Electron probe analysis indicated the presence of Ca-rich oxide at the grain boundaries. The micro-hardness, modulus of rupture, modulus of elasticity, and impact strength were determined. Average modulus of rupture was 19,000 psi, while an average modulus of elasticity was measured to be 55,000,000 psi. Examination of the fracture-exposed surfaces indicated predominantly transgranular fracture with distinct step-cleavage pattern. These data are representative of the as-received calcium hexaboride compound commercially available in production quantities. Author (GRA)

N74-18215# General Electric Co., Schenectady, N.Y. Corporate Research and Development.
METALLIC COMPOSITES FORMED IN SITU BY REACTIONS IN THE SOLID STATE Final Technical Report, 1 Dec. 1972 - 19 Oct. 1973
James D. Livingston Oct. 1973 32 p refs
(Contract N00019-73-C-0173)
(AD-772154; SRD-73-157) Avail: NTIS CSCL 11/4

The goal of the program was to develop a scientific basis for the production of aligned two-phase composites by the directional control of solid-state phase transformations. Aligned eutectoids were found to possess substantial mechanical strength and thermal stability, and therefore show promise as high-temperature structural materials. Eutectoid alloys aligned during the study were Co-Si, Fe-Al, Cu-Al, Cu-In, Ni-In, and Ni-Sn. In addition to thermal stability and mechanical strength, other subjects studied were the velocity-spacing relation, interphase crystallographic relationships, and a suggested up-transformation process. (Modified author abstract) GRA

N74-18216# Watervliet Arsenal, N.Y.
FAILURE PHENOMENA OF SOME FIBER-REINFORCED COMPOSITE STRIPS WITH A HOLE
Y. F. Cheng Oct. 1973 26 p refs
(DA Proj. 1T0-62105-A-349)
(AD-771060; R-WV-T-6-40-73) Avail: NTIS CSCL 11/4

Ten composite strips with a hole were loaded to failure under tension. Failure stresses and strains were compared with the composite ultimate strengths. The results showed that while the hole reduced the composite strength, the effect on strain however depends on the properties of composite components. The strain was reduced in boron-aluminum, but increased in boron-epoxy and in fiberglas-epoxy. Author (GRA)

N74-18217# Corning Glass Works, N.Y. Technical Products Div.
PRODUCTION AND INVENTORY OF HIGH QUALITY OPTICAL GLASS BLANKS Final Technical Report, Mar. 1967 - Sep. 1972
John B. Helm Nov. 1973 31 p
(Contract F33615-67-C-1683; AF Proj. 8263)
(AD-771806; AFAL-TR-73-293) Avail: NTIS CSCL 11/2

The objective of the program was to establish a manufacturing capability for high acuity optical glass blanks within the United States and to prove that capability by producing an inventory of 28 optical glasses. The report describes the background of the project, the preparations for productions, the production operations, the one composition approach, and data on glass produced. The production of this glass demonstrates that the technical knowhow and evaluation techniques exist in the United States but the demand for such glass is not sufficient to economically maintain a production facility ready to make such glass without funding from some governmental source. (Modified author abstract) GRA

N74-18218# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
FRACTURE AND DEFORMATION OF ALUMINA Final Report
Sheldon M. Wiederhorn 31 Jul. 1973 16 p refs Sponsored by AROD

(AD-772066; NBSIR-73-297; AROD-5724-11-MC) Avail: NTIS CSCL 11/2

The report summarizes work conducted during the past eight years on the fracture and deformation of ceramic materials. Accomplishments discussed in this report include: an elucidation of fracture process of aluminum oxide and sodium chloride; the development of techniques to study the deformation of aluminum oxide during abrasion; and the development of techniques for measuring fracture mechanics parameters on ceramic materials. Author (GRA)

N74-18580 Joint Publications Research Service, Arlington, Va.
HEAT-RESISTANT COATINGS
A. Ya. Sitnikova *In its* Vestn. of the USSR, Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 116-119 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 85-87 Conf. held at Leningrad, 20-23 Mar. 1973 (For availability see N74-18567 09-34)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-18219 Newcastle-upon-Tyne Univ. (England). Computing Lab.
THE PERILS OF INDIRECT PROOF OR ANOTHER EFFICIENT SEARCH ALGORITHM TO FIND THE ELEMENTARY CIRCUITS OF DIRECTED GRAPHS
Peter Ernst Lauer Sep. 1973 27 p refs
(Rept-42) Copyright. Avail: Issuing Activity

An analysis of Tiernan's algorithm is presented yielding a more economical algorithm with respect to storage space. Proofs of his theorems are given. Author

N74-18220# Sheffield Univ. (England). School of Probability and Statistics.
CHARACTERIZATIONS FOR THE QUEUEING SYSTEM M/G/INFINITY
D. N. Shanbhag Feb. 1973 8 p refs
(Rept-128/DNS-8) Avail: NTIS HC $4.00

For the queueing system M/M/s with infinite waiting space and M/G/infinity which are special cases of M/G/s system, the steady state distributions of the number of departures during an interval are known to be Poisson and hence are infinitely divisible. It is also clear that for the systems M/M/1 with infinite waiting space and M/G/infinity the steady state joint distributions of the number of departures during an interval and the queue length at its termination are infinitely divisible. Author

N74-18221# RAND Corp., Santa Monica, Calif.
UNCRACKABLE DATA BANKS
N. Z. Shapiro and M. Davis Nov. 1973 12 p refs
(Grant NSF GI-29943)
(R-1382-NSF) Avail: NTIS HC $4.00

A question raised by Coates is answered who asks if there are fundamental, logical, and mathematical principles by which one could conclude the existence of uncrackable data banks. If both protector and intruder have finite but unlimited resources, then it is concluded that an uncrackable data bank cannot, in principle, exist as defined by Coates. If protector and intruder have limited resources, however, then an uncrackable data bank may exist. Author

N74-18222# RAND Corp., Santa Monica, Calif.
THE NATURE OF UNCERTAINTY
G. H. Fisher Nov. 1973 9 p refs
(P-5133) Avail: NTIS HC $3.00

Uncertainty in weapon systems is discussed in terms of risk (statistical uncertainty), and state-of-the-world or requirements uncertainty. The types of methods for dealing with uncertainty are given as Monte Carlo, sensitivity analysis, range of estimates, and supplemental discounting. The implications of uncertainty for DOD policy are considered. F.O.S.

N74-18223# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
MULTILOOP AMPLITUDES IN ADDITIVE DUAL RESONANCE MODELS
C. Montonen Mar. 1973 29 p refs
(DAMTP-73/12) Avail: NTIS HC $4.50

General multiloop amplitudes in additive dual resonance models are calculated, with spurious states propagating internally in the loops. The result shows the same automorphic structure as has been found in the Veneziano model. The case of the Neveu-Schwarz model is considered in more detail. Author

N74-18224# Academy of Sciences of the Ukranian SSR, Kiev (USSR). Inst. of Cybernetics.
ANALYSIS OF PULSE-FREQUENCY MODULATED SYSTEM FOR STABILIZATION OF LINEAR UNSTABLE PLANT
Y. N. Chekhovoi, I. F. Radchenko, V. V. Volossov, and L. I. Voronova Toulouse CNRS 1973 9 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; Sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

The pulse frequency modulated system for stabilization of the second order linear plant with two zero poles is considered. Some restrictions on the system parameters are found for which all system trajectories end in the given vicinity of the origin where only the simplest limit cycles can exist (with one pulse per half a period). The analysis is based on Liapunov's direct method. For various types of limit cycles the bifurcation values of the parameters are determined. Estimations of precision and economics for steady state regimes are given. Author (ESRO)

N74-18225# Academy of Sciences of the Ukranian SSR, Kiev (USSR). Inst. of Cybernetics.
ASYMPTOTIC STABILITY IN-THE-LARGE OF PULSE-FREQUENCY MODULATED SYSTEMS OF THE SECOND TYPE
Y. N. Chekhovoi Toulouse CNRS 1973 6 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

Sufficient conditions for the stability in-the-large of the pulse frequency modulated systems of the second type have been obtained. The cases of stability in-the-whole (complete stability) and in the limited domain have been considered. ESRO

N74-18226# Universite des Sciences et Techniques de Lille (France). Centre d'Automatique.
STABILITY STUDY OF NON-LINEAR ITERATIVE VECTORIAL SEQUENCE BY MAJORATION [SUR UNE ETUDE PAR MAJORATION DE LA STABILITE DES SUITES RECURRENTES VECTORIELLES NON LINEAIRES]
P. Borne, J. C. Gentina, and F. Laurent Toulouse CNRS 1973 8 p refs Presented at the Intern. colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

A specific form of evolution equations for monovariable random sampled processes is used for the stability study of nonlinear iterative vectorial sequences. A simple stability criterion is derived through the use of systems the behavior of which is a majoration of that of the actual system. The criterion consists in the definition of nonlinear stability conditions by application of asymptotic linear stability to a suitably chosen model deduced from the original process. The properties of matrices with non-negative terms allow an interpretation of the criterion while relating it to well known criteria derived from the concept of matrix norm relations to stochastic processes. Some critical cases are studied starting from an adequate representation in the complex variable field. Two examples are given. ESRO

N74-18227# Montreal Univ. (Quebec). Dept. d'Informatique.
ERROR ANALYSIS FOR CERTAIN TRANSFORMATIONS OF INTEREST IN AUTOMATIC CONTROL
N. F. Stewart Toulouse CNRS 1973 10 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse,

10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS Supported in part by Natl. Res. Council, Can.
Avail: NTIS HC $4.00

Several aspects of error analysis for transformations of interest in automatic control are considered. Computational evidence is given that interval arithmetic is useless for transformations when used in a straightforward way. A distinction on a priori and a posteriori bounds was made and examples of a priori bounds similar to those previously given are presented. The methods involved are shown to be generally usable. Error estimation is briefly discussed together with the search for a solution which is in error by an amount smaller than a pre-assigned tolerance.
ESRO

N74-18228# California Univ., Berkeley. Dept. of Electrical Engineering and Computer Sciences.
SOME NEW RESULTS IN STABILITY AND PERFORMANCE INDEX OF LINEAR DISCRETE SYSTEMS
E. I. Jury Toulouse CNRS 1973 9 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

The stability of linear discrete systems is described in terms of the coefficients of the system characteristic equation. Two conditions for stability must be fulfilled: a matrix of order n-1 squared must have all inner matrices positive, and n/2 conditions of linear inequalities obtained from the coefficients of the characteristic equation must be positive. If the A matrix of the system equations is in general form, the criterion may be expressed as a n-2 squared matrix to have all inner determinants negative. The performance index is then evaluated as the ratio of two inner determinants. It is shown that the performance index and higher order moments may be computed recursively with stability and performance index calculations being performed simultaneously. A computational algorithm of use in these calculations is briefly described.
ESRO

N74-18229*# California Univ., Berkeley. Dept. of Electrical Engineering and Computer Sciences.
Lp-STABILITY (1 LESS THAN OR EQUAL TO p LESS THAN OR EQUAL TO INFINITY) OF MULTIVARIABLE NONLINEAR TIME-VARYING FEEDBACK SYSTEMS THAT ARE OPEN-LOOP UNSTABLE
Frank M. Callier and C. A. Desoer Toulouse CNRS 1973 7 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
(Grant NGL-05-003-016)
(NASA-CR-137097) Avail: NTIS HC $4.00

A class of multivariable, nonlinear time-varying feedback systems with an unstable convolution subsystem as feedforward and a time-varying nonlinear gain as feedback was considered. The impulse response of the convolution subsystem is the sum of a finite number of increasing exponentials multiplied by nonnegative powers of the time t, a term that is absolutely integrable and an infinite series of delayed impulses. The main result is a theorem. It essentially states that if the unstable convolution subsystem can be stabilized by a constant feedback gain F and if incremental gain of the difference between the nonlinear gain function and F is sufficiently small, then the nonlinear system is L(p)-stable for any p between one and infinity. Furthermore, the solutions of the nonlinear system depend continuously on the inputs in any L(p)-norm. The fixed point theorem is crucial in deriving the above theorem.
Author (ESRO)

N74-18230# Kyushu Univ., Fukuoka (Japan). Dept. of Mathematics.
PERIODIC SOLUTIONS TO A CERTAIN DIFFERENCE EQUATION AND THEIR APPLICATIONS TO PSEUDO-PERIODIC DIFFERENTIAL EQUATIONS
Minoru Urabe Toulouse CNRS 1973 9 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

A method for finding a solution to a specific type of difference equation with variables periodic with independent periods is presented. One of the variables, u, is a function of all other variables. If the complete equation is linear in u, a periodic solution is given in terms of an infinite series under some assumptions. If the equation is nonlinear in u, two methods are proposed, one of which is based on the interative process and the other on a generalized Newton method. The results are applied to the problem of finding pseudoperiodical solutions to pseudoperiodical equations.
ESRO

N74-18231# Brussels Univ. (Belgium). Dept. of Rational Mechanics.
STABILIZATION OF COWELL'S CLASSICAL FINITE DIFFERENCE METHOD FOR NUMERICAL INTEGRATION OF THE FREE DUFFING EQUATION
R. VanDooren Toulouse CNRS 1973 6 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

A modification of the Cowell classical finite difference method to stabilize the numerical integration of a Jacobian elliptic function is presented. Application is made in nonlinear systems with cubic nonlinearities such as the Duffing free equation. Computational evidence is given that the stabilizing effect obtained by modifying only the highest coefficients of Cowell's formula induces an average improvement of about five decimal digits. An extension of the method to weakly forced Duffing equations is outlined.
ESRO

N74-18232# Observatoire du Mont-Gros, Nice (France).
NUMERICAL STUDY OF DISCRETE PLANE AREA-PRESERVING MAPPINGS [ETUDE NUMERIQUE DE TRANSFORMATIONS PLANES DISCRETES CONSERVANT LES AIRES]
Francoise Rannou Toulouse CNRS 1973 14 p refs In FRENCH; ENGLISH summary Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

Dynamical systems with two degrees of freedom correspond to two dimensional mapping. Restricting this to discrete mappings operating only on integers allows an exact numerical study without round off errors. Any point is then shown to belong to a finite cycle. For comparison a random mapping with a suitable algorithm is defined and its main properties detailed. These properties are shown to be similar to the observed properties of definite mappings.
ESRO

N74-18233# Observatoire du Mont-Gros, Nice (France).
SOME NUMERICAL RESULTS ON THE EXISTENCE, DIMENSION, AND DISAPPEARANCE OF INVARIANT VARIETIES OF A FOUR- TO SIX-DIMENSIONAL MEASURE-PRESERVING TRANSFORMATION [QUELQUES RESULTATS NUMERIQUES SUR L'EXISTENCE, LA DIMENSION ET LA DISPARITION DES VARIETES INVARIANTES D'UNE TRANSFORMATION A QUATRE ET A SIX DIMENSIONS CONSERVANT LA MESURE]
C. Froeschle and J.-P. Scheidecker Toulouse CNRS 1973 13 p refs In FRENCH Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

A dynamical system with n degrees of freedom is shown, by computerized simulation, to have in general n minus one or zero primary integrals discounting the energy integral. The c-system character of orbits appears even during the diffusion process when the primary integrals vanish. The onset of ergodicity is studied with various degrees of precision by four-dimensional and six-dimensional automorphisms.
ESRO

N74-18234# Alabama Univ., University. Dept. of Physics.
STABILITY OF AREA-PRESERVING MAPPINGS
James H. Bartlett Toulouse CNRS 1973 14 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse,

10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
(Grant NSF GP-20122)
Avail: NTIS HC $4.00

Since for Hamiltonian systems area is preserved in the phase plane, their stability can be determined by studying the stability of area preserving mapping. First, for any elliptic fixed point of Tin, determine the two adjacent hyperbolic fixed points H1 and H2 and the invariant curves (eigencurves) through them. For perfectly integrable systems, the eigencurves through H1 also pass through H2 and form separatrices which bound a stable region containing the elliptic fixed point. For non-integrable systems for forward eigencurves from H1 intersect the backward ones from H2 to form intricate networks of intersecting loops. The cell will be stable when the ratio of loop area to cell area is very small. Satellite fixed points of order nk, with k in integer, must be determined such that the oscillations of the eigencurves are not detectable. Author (ESRO)

N74-18235# European Organization for Nuclear Research, Geneva (Switzerland).
SOME PROPERTIES OF A CONSERVATIVE SECOND ORDER RECURRENCE WITH A BOUNDED NON-LINEARITY
I. Gumowski and J. K. Trickett (Leeds Univ., Engl.) Toulouse CNRS 1973 8 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

It is shown that the three known stochastic features (instability rings, diffusion, and stochastic instability) exist also when the nonlinearity of the recurrence is bounded. A specific consequence of boundedness is the existence of external and mixed cycles. Author (ESRO)

N74-18236# Georgia Inst. of Tech., Atlanta. School of Physics.
EMPIRICAL DETERMINATION OF INTEGRABILITY FOR NONLINEAR OSCILLATOR SYSTEMS USING AREA-PRESERVING MAPPINGS
Joseph Ford Toulouse CNRS 1973 10 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
(Grant AF-AFOSR-2453-73)
Avail: NTIS HC $4.00

Utilizing the fact that the motion for oscillator systems with two degrees of freedom can be reduced to a plane area-preserving mapping, it is demonstrated by examples that a numerical determination of the stability character for fixed points of the associated mapping provides a sensitive test for integrability of the oscillator system. In addition to providing a test for integrability, this method reveals further insight into the known pathology of non-integrable systems. Author (ESRO)

N74-18237# Technische Hochschule, Graz (Austria).
ON LINEAR GEOMETRIC DIFFERENCE EQUATIONS
W. Hahn Toulouse CNRS 1973 9 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

A geometric difference equation with polynomial coefficients up to degree r and parameter q lower than one in absolute value is studied. It is shown to have formal solutions depending on an arbitrary parameter. The solutions appear as series and their study is detailed. Conditions are given which guarantee the series convergence, i.e., that the formal solutions are actual solutions and that r different solutions do form a fundamental system for the equation. An analogous case is considered for a vector equation with polynomial matrix coefficients. ESRO

N74-18238# European Organization for Nuclear Research, Geneva (Switzerland).
SOLUTION STRUCTURE OF A CONSERVATIVE SECOND ORDER RECURRENCE WITH AN UNBOUNDED NON-LINEARITY
I. Gumowski Toulouse CNRS 1973 11 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

The solution structure is deduced from the distribution in the phase plane of cycles and invariant curves. The cycles surrounding the reference center (0,0) are ordered according to bifurcations giving rise to them. The configurations of invariant curves are found to increase in complexity with their mean geometrical distance from (0,0). It is shown that (0,0) is first surrounded by (truly) closed invariant curves, and then by intersecting ones. The latter are classified according to the divergence rate of iterates. The properties of invariant curves permit division of the plane into the following regions: island structures, instability rings, diffusion and stochastic instability. Author (ESRO)

N74-18239# Amoco Production Co., Tulsa, Okla.
TECHNIQUES FOR STABILIZING TWO-DIMENSIONAL FINITE DIFFERENCE OPERATORS
John L. Shanks, R. R. Read, and S. Treitel Toulouse CNRS 1973 16 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

Two techniques for stabilization of two dimensional finite difference recursive filters are presented. The basic element of the techniques proposed is the achievement of a denominator polynomial of minimum phase. The first method uses the properties of the planar least squares inverse. The other method is a two dimensional extension of the Hilbert transform. A discrete approximation to the Hilbert transform is provided for by the trapezoidal rule using the discrete Fourier transform. Neither proposed method is ideal and their drawbacks are outlined. Examples and counter-examples are detailed. ESRO

N74-18240# Akademiya Nauk SSSR, Novosibirsk. Inst. of Nuclear Physics.
SOME NUMERICAL EXPERIMENTS WITH A NONLINEAR MAPPING: STOCHASTIC COMPONENT
B. V. Chirikov and F. M. Izraelev Toulouse CNRS 1973 16 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

Numerical experiments with simple canonical mapping are described. The mapping simulates the motion of a nonlinear oscillator under periodic perturbation. The existence of a stochastic component is shown and its general structure demonstrated. Some data are given concerning the stable component in both stochastic region and transitional zone. Overall area of the stable component decreases exponentially with the stochasticity parameter. The impact of a weak dissipation on the stochastic component is studied. It is shown that stochastic motion is generally destroyed, degenerating into a periodical one. Under sufficiently strong dissipation a foliation of the phase plane is observed which delays considerably the destruction of the stochastic component. Author (ESRO)

N74-18241# Polish Academy of Sciences, Cracow. Inst. of Mathematics.
ASYMPTOTIC PROPERTIES OF SOLUTIONS OF LINEAR FUNCTIONAL EQUATIONS AND LINEAR RECURSIVE EQUATIONS
Bogdan Choczewski Toulouse CNRS 1973 5 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

The asymptotic behavior of continuous solutions for a specified type of functional equation of the first order in a single real variable and depending on three given functions f, g, h, was investigated. Asymptotic properties for f, g, h, were assumed at the origin and the functional equations solutions considered are limited to those continuous in a neighborhood of the origin. From these investigations, information was gained on the behavior at infinity of the linear recurrence equation provided asymptotic

properties of the sequences of coefficients of the equation are known. A specific case where the slope coefficient tends towards unity while the ordinate at origin coefficient tends towards zero, is detailed. ESRO

N74-18242# Joint Inst. for Nuclear Research, Moscow (USSR). Lab. of Theoretical Physics.
ON THE EXISTENCE OF DOUBLE-ASYMPTOTIC SOLUTIONS FOR THE HAMILTONIAN SYSTEM
V. K. Melnikov Toulouse CNRS 1973 10 p refs Presented at the Intern. Colloq. on Point Mapping and its Appl., Toulouse, 10-14 Sep. 1973; sponsored by the Lab. d'Autom. et d'Anal. des Systemes of the CNRS
Avail: NTIS HC $4.00

Given a Hamiltonian system with circular periodicity in q for the Hamiltonian function, analytic in all variables in a given domain, the existence of two families of solutions circularly periodical is demonstrated. Under general assumptions it is then shown that the system has double asymptotic solutions in a specified domain that are bounded by the two previously mentioned solutions. ESRO

N74-18243# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
ALGORITHMS FOR OPTIMUM AND SUB-OPTIMUM PARTITION OF GRAPHS [ALGORITHMES DE DECOMPOSITIONS OPTIMALE ETSOUS-OPTIMALE DES GRAPHES]
M. Richetin Nov. 1973 15 p refs In FRENCH
(LAAS-CH-73-I-33) Avail: NTIS HC $4.00

Two types of optimal graph decomposition are defined, and two methods, based on flow theory, which seem efficient for graphs of large dimensions, are proposed. The two types of decomposition defined, are: optimal partitioning of a graph, and the minimal articulation set. Algorithms were developed for both decomposition types. The solution of the problem using an optimal or sub-optimal algorithm and taking into account all the constraints, is rather time consuming. Solution by means of an optimal or sub-optimal algorithm, depending on the initial parameters, and carried stepwise, modifying these parameters to take account of the constraints, is discussed. Algorithms using flow theory follow this method and have been shown to be efficient. ESRO

N74-18244# Societe d'Economie et de Mathematique Appliquees, Montrouge (France). Div. Applications Mathematiques.
DIGITAL FILTERING. VOLUME 1: SUMMARY REPORT Final Report [FILTRAGE NUMERIQUE. VOLUME 1: RAPPORT DE SYNTHESE RAPPORT FINAL]
[1973] 69 p In FRENCH 3 Vol.
(Contract ESTEC-487/72-AR)
(ESRO-CR(P)-349) Avail: NTIS HC $6.50

An analysis of filtering in signal processing, operating conditions, algorithmic study, and evaluation of available methods are considered. Results are detailed with regard to operator approximation, invariance, functional transforms, sampling, interpolation, discretization, truncation, and approximation with nonconventional norms. A classification of digital filters is given, together with relevant parameters. Adequate computer programs are studied, with regard to program hierarchy task distribution at the various levels, modules interfaces, and I/O routines. Future developments such as improved software, direct optimization, sounding off errors, and new applications are also outlined. ESRO

N74-18245# Societe d'Economie et de Mathematique Appliquees, Montrouge (France). Div. Applications Mathematiques.
DIGITAL FILTERING. VOLUME 2: ANALYTICAL REPORT Final Report [FILTRAGE NUMERIQUE. VOLUME 2: RAPPORT ANALYTIQUE RAPPORT FINAL]
[1973] 334 p refs In FRENCH 3 Vol.
(Contract ESTEC-487/72-AR)
(ESRO-CR(P)-350) Avail: NTIS HC $19.75

The fundamental concepts are detailed with regard to invariance, functional transformations, approximation, norms, linear signal processing, sampling, dionetization, truncation, and round off errors. Methods of filtering are reviewed, regarding integral transforms, integrodifferential linear equations, stochastic interpolation and extrapolation, and signal and noise aspects. Computing methods are discussed including transition from continuous to sampled to finite treatment. The descriptive parameters are outlined for both theoretical definition and approximation parameters. Required algorithms are discussed, together with an evaluation of performances for round off errors and direct optimization. ESRO

N74-18246# Societe d'Economie et de Mathematique Appliquees, Montrouge (France). Div. Applications Mathematiques.
DIGITAL FILTERING. VOLUME 3: PROGRAM REPORT AND USERS MANUAL Final Report [FILTRAGE NUMERIQUE. VOLUME 3: RAPPORT-PROGRAMME ET MANUEL D'UTILISATION RAPPORT FINAL]
[1973] 326 p In FRENCH 3 Vol.
(Contract ESTEC-487/72-AR)
(ESRO-CR(P)-351) Avail: NTIS HC $19.50

A set of computer programs for numerical filtering is presented. It is based on a need for evolutionary capability together with ease of use, leading to a four level hierarchy. The package is modular and the various programs can be considered as part of a program library. The four levels are: (1) main program (data input, command parameters, theoretical model parameter approximation, and theoretical model decoding); (2) theoretical model (validity tests, ancillary computation, and approximation model decoding); (3) approximation model (validity tests, computation of coefficients, and optimization); and (4) editing. All programs and subroutines are detailed and flowcharts and FORTRAN listings are given. ESRO

N74-18247# Naval Ship Research and Development Center, Bethesda, Md.
SOME APPLICATIONS OF THE FAST FOURIER TRANSFORM Final Report
Feodor Theilheimer Jul. 1973 17 p refs
(AD-771409; NSRDC-4231) Avail: NTIS CSCL 12/1

Fourier's approach to the problem of heat conduction served as the introduction to Fourier series and Fourier integral. This led later to the discrete Fourier transform and recently to the fast Fourier transform. The fast Fourier transform, serving as an expeditious means to pass from functions of time to functions of frequency, contributes to the analysis of time-invariant systems for deterministic as well as stochastic situations. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-18248# Israel Program for Scientific Translations, Ltd., Jerusalem.
SOME CHARACTERISTICS OF TROPICAL DEPRESSIONS OVER THE ATLANTIC
L. V. Kool 1973 6 p Transl. into ENGLISH from Meteorol. i Gidrol., (USSR), no. 9, 1972 p 82-85 Sponsored by NOAA and NSF
(TT-73-50012/4) Avail: NTIS HC $4.00

Characteristics of six tropical depressions are considered, intersecting the region studied by the ship, Akademik Kurchatov (16 deg N, 33 deg W) in August-September 1970. Synoptic conditions were found to be similar at the ocean surface for all six depressions. The trajectory of the depressions is presented, as well as an aerological diagram during passage of the tropical depression. J.A.M.

N74-18249# Israel Program for Scientific Translations, Ltd., Jerusalem.
SEMIDIURNAL MIGRATIONS OF NORTH ATLANTIC AND SOUTH ATLANTIC SUBTROPIC ANTICYCLONES
R. V. Abramov 1973 5 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 201, no. 1, 1971 p 67-68 Sponsored by NOAA and NSF
(TT-73-50012/1) Avail: NTIS HC $4.00

Attempts to find some pattern in the motion of quasi-permanent centers of action of the atmosphere were made. Studies

of secular and seasonal migrations of the Icelandic Low and the Azores High have established that certain common features exist in the motion of the centers of action in the North Atlantic. The seasonal transformation of North Atlantic and South Atlantic highs (migration of centers, strength fluctuation, propagation over the area) seem to be related to each other and to the characteristic points of the ecliptic. The assumption that the subtropic anticyclones are the determining factor is corroborated: the seasonal, monthly and daily fluctuations of the intertropical convergence zones were found to be closely linked with the migrations and fluctuations of the subtropical anticyclones of both hemispheres. Author

N74-18250# National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, SEPTEMBER 1973 Meteorological Records Documentation no. 5.4
Jan. 1974 95 p
Avail: NTIS HC $7.75

Daily mosaics are presented for the Northern and Southern Hemispheres for the month of September, 1973. The mosaics were prepared by computer from swaths by the NOAA 2 satellite. F.O.S.

N74-18251# RAND Corp., Santa Monica, Calif.
UNDERSTANDING CLIMATIC CHANGE
W. L. Gates Nov. 1973 15 p
(P-5114) Avail: NTIS HC $4.00

An overview of the general problem of climate, as well as a description of the scientific research being directed to its solution is presented. An objective view of the problems and prospects for understanding climatic change is given. Mathematical models for numerical weather forecasting are described. Author

N74-18252# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 11, 1973
15 Feb. 1974 205 p refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 1-126
(JPRS-61249) Avail: NTIS HC $13.25

Articles on microclimate, agricultural meteorology, weather forecasting and climate control, hydrological forecasting, and related activities are presented. The articles are based on projects conducted in the Soviet Hydrometeorological Service. For individual titles, see N74-18253 through N74-18272.

N74-18253 Joint Publications Research Service, Arlington, Va.
THE SOVIET-AMERICAN BERING EXPERIMENT
K. Ya. Kondratyev, V. V. Melenyev, and Yu. I. Rabinovich *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 1-10 Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 3-10 (For availability see N74-18252 09-20)

The application of data from measurements of the radiofrequency thermal radiation of underlying surface and the atmosphere to solve practical meteorological and oceanographic problems is discussed. A joint U.S. and U.S.S.R. expedition to the Bering Sea was planned to conduct simultaneous radiation and microwave measurements from ships and aircraft. The data obtained was used to: (1) develop procedures for identifying precipitation zones, (2) analyzing ice cap characteristics, (3) determining the ocean surface temperature, and (4) measuring the size of the swell. A map of the area in which the tests were conducted is presented and the methods for conducting the tests are described. P.N.F.

N74-18254 Joint Publications Research Service, Arlington, Va.
CERTAIN STATISTICAL CHARACTERISTICS OF A WIND FIELD IN THE TROPOSPHERE AND STRATOSPHERE AND THE SIMULATION OF LARGE-SCALE ATMOSPHERE PROCESSES
N. Z. Pinus and V. A. Shnaydman *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 12-25 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 11-21 (For availability see N74-18252 09-20)

On the basis of a statistical analysis of data from specific, repeated series of rawind observations, the spatial anisotropy coefficients and the dependence of vertical coherence on the scale of the movement are shown. The anisotropy coefficients have a magnitude on the order of .01 and decrease as the motion time scale increases; this decrease is about 50 percent greater in the summer than in the winter. The correlational coherence of the energy tendencies of averaged and pulsating movements for time scales ranging from 6 to 192 hours are examined. A 3-day period divides motions into two independent areas, the energy interaction between which is negligibly small. Author

N74-18255 Joint Publications Research Service, Arlington, Va.
ON USING THE PRINCIPLES OF ANALOGY TO STUDY THE PREDICTABILITY OF ATMOSPHERIC PROCESSES AND SOLVE WEATHER FORECASTING PROBLEMS
G. V. Gruza and R. G. Reytenbakh *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 26-41 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 22-31 (For availability see N74-18252 09-20)

The problems involved in the application of the principle of analogy of meteorological fields over limited regions to determining the limits of predictability and solving weather forecasting problems are discussed. The results of numerical experiments are presented. The algorithm for forecasting by analogy should be optimized by the stochastic approximation method. Author

N74-18256 Joint Publications Research Service, Arlington, Va.
ON THE FORMULATION AND SOLUTION OF THE INITIAL-VALUE PROBLEM FOR HYDRODYNAMIC EQUATIONS c12
V. I. Gubin *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 42-48 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 32-37 (For availability see N74-18252 09-20)

The solution of the initial-value problem for the general equation of motion (in vector form) of an ideal liquid is discussed. The introduction of the concept of a rotation operator, plus some of its properties, enables the general expression for the velocity of a particle along its trajectory at a particular moment of time to be written. Approximate expressions for the velocity and trajectory of movement of a liquid particle are presented. Author

N74-18257 Joint Publications Research Service, Arlington, Va.
ON CERTAIN STRUCTURAL PECULIARITIES IN THE QUASI-BIENNIAL CYCLE IN THE EQUATORIAL STRATOSPHERE c13
O. N. Belinskiy and G. S. Buldovskiy *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 49-60 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 38-45 (For availability see N74-18252 09-20)

A time profile of zonal wind components, using data from aerological observations of the equatorial stratosphere that were made in the Indian and Pacific Oceans, from 1961 to 1972 is presented. Certain structural peculiarities in the quasi-biennial wind cycle and how it is interrelated with stratospheric circulation in the extratropical latitudes during different seasons of the year are explained. The fact that cyclic air temperature variations occur in the equatorial stratosphere is established. Author

N74-18258 Joint Publications Research Service, Arlington, Va.
THE NATURE OF THE CIRCULATION IN THE EQUATORIAL STRATOSPHERE WITH PREVAILING WESTERLIES AND EASTERLIES c13
L. G. Nemirovskaya *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 61-72 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 46-53 (For availability see N74-18252 09-20)

The structure of the baric field and the day-to-day variability of the meteorological conditions, in space and time, for the westerly and easterly phases of the quasi-biennial cycle is presented. The daily charts of the 100-, 50-, 30-, 20-, and 10-mb surfaces are used. The vertical temperature distribution for the period when westerly and easterly winds prevail in the equatorial stratosphere is analyzed. Author

N74-18259 Joint Publications Research Service, Arlington, Va.
THE VARIABILITY OF MARINE HYDROLOGICAL ELEMENTS AND THE CALCULATION OF THE DISCRETENESS OF

OBSERVATIONS

G. S. Ivanov and A. N. Ovsyannikov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Jul. 1974 p 73-81 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 54-59 (For availability see N74-18252 09-20)

Using materials from observations of the level, temperature, and salinity of the water in the coastal zones of various seas, the variability of these elements are discussed. Some of its quantitative and statistical characteristics are analyzed. On the basis of the analysis of the variability, a preliminary calculation of the optimum variant for the temporal and spatial discreteness of measurements is made. Author

N74-18260 Joint Publications Research Service, Arlington, Va.
A TWO-LAYER MODEL FOR COMPUTING THE THICKNESS OF AN ISOTHERMIC LAYER IN THE OCEAN c13

V. I. Kalatskiy *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Jul. 1974 p 82-93 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 60-68 (For availability see N74-18252 09-20)

A method for calculating the thickness of a quasi-homogeneous layer in the ocean is presented. An equation that determines the layer's thickness as a function of wind velocity, the flow of heat across the air-water interface, the vertical component of the currents' velocity, the advective heat transfer, the sea water's transparency, and the rate of exchange inside the thermocline is developed. A limited solution for this equation, and an approximate solution for it in the cases without advective heat transfer and with intensive absorption of radiation in the upper layer is shown. The results obtained by computing the homogeneous layer's thickness by his formulas with actual data obtained by marine observations are compared. Author

N74-18261 Joint Publications Research Service, Arlington, Va.
ONE-DIMENSIONAL HYDRODYNAMIC MODELS OF OVERLAND RUNOFF c12

V. N. Demidov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Jul. 1974 p 94-103 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 69-76 (For availability see N74-18252 09-20)

A set of hydrodynamic equations in complete form and a set of kinematic wave equations are used to describe the movement of water over the surface of a slope. The equations are solved numerically, by an explicit method of grids. The formulation of the lower boundary condition has a substantial effect on the calculation of the overland flow's hydrograph when the hydrodynamic equations are used in complete form. Author

N74-18262 Joint Publications Research Service, Arlington, Va.
COMPUTER CALCULATION OF THE HYDROLOGICAL REGIME OF SOIL AS A METHOD OF APPLYING THE RESULTS OF LYSIMETER OBSERVATIONS TO FIELD CONDITIONS c13

V. P. Yemets, L. L. Zhuravleva, V. Ya. Kulik, and N. V. Pichugina *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Jul. 1974 p 104-108 Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1973 p 77-80 (For availability see N74-18252 09-20)

For the purpose of substantiating the computer calculation of moisture reserves under natural (field) condition through the use of the equation describing the moisture's movement in the aeration zone, a model (of a hydraulic evaporation or a lysimeter) that is applied directly at the measuring point provides the necessary accuracy and completeness of information. When a satisfactory convergence of results is achieved, the soil's water regime is calculated on a computer, using the same program and the hydrological and hydrophysical characteristics that apply to the section under discussion. In 80 percent of the cases, the calculation error does not exceed 5-9 percent of the measured water reserves in the instrument and the field respectively.
Author

N74-18263 Joint Publications Research Service, Arlington, Va.
ON THE POSSIBILITY OF IMPROVING THE ACCURACY WITH WHICH AVERAGE OBLAST YIELDS OF AGRICULTURAL CROPS ARE PREDICTED

M. S. Kulik and V. A. Zhukov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 110-121 refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 81-89 (For availability see N74-18252 09-20)

The necessity of using the integral characteristics of agrometeorological parameters (obtained with due consideration for their areal variability) in the computational procedures for predicting average oblast yields of agricultural crops is demonstrated. A brief description is given of the procedure for calculating the average value of an element, weighted over an area, that was proposed for meteorological applications. The results of numerical experiments in calculating the average value of the soil moisture under winter crops for the various oblasts are presented. Author

N74-18264 Joint Publications Research Service, Arlington, Va.
STRATOSPHERIC WARMING IN JANUARY - FEBRUARY 1973 c13

I. V. Bugayeva, L. A. Ryazanova, and D. A. Tarasenko *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 122-128 ref Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 90-93 (For availability see N74-18252 09-20)

An analysis of the high altitude baric maps of the 35-60 kilometer layer and vertical stratospheric and mesospheric warming profiles for January to February 1973 is presented. A vertical time profile of the atmosphere over Hayes Island for the period November 1972 to February 1973 is provided. Baric maps for altitude of 35 and 55 kilometers for 27 January to 2 February 1973 are included. Author

N74-18265 Joint Publications Research Service, Arlington, Va.
ON THE PROBLEM OF THE PERIPHERAL FRONTS OF OCCLUDED CYCLONES

R. F. Burlutskiy and A. I. Yefimov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 129-132 Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 94-96 (For availability see N74-18252 09-20)

A special type of meteorological front in occluded cyclones is discussed. An analysis of satellite photographs has shown that such fronts have not been correctly represented on synoptic charts. The mechanism by which the fronts are formed is analyzed and examples of frontal formation are provided. Author

N74-18266 Joint Publications Research Service, Arlington, Va.
DETERMINING THE COEFFICIENT OF ATMOSPHERIC AEROSOL TURBIDITY

K. A. Tavartkiladze *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 134-138 refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 96-98 (For availability see N74-18252 09-20)

The parameters of aerosol turbidity and the corrected altitude of a uniform aerosol-laden atmosphere are discussed. The application of a differential equation which is solved by the initial value problem method is described. Mathematical models are provided to support the theoretical considerations. Author

N74-18267 Joint Publications Research Service, Arlington, Va.
ON THE POWER OF THE EFFECT OF CORPUSCULAR RADIATION FLUXES ON CIRCULATION CONDITIONS IN THE LOWER LAYERS OF THE ATMOSPHERE c13

I. V. But *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 139-148 refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 99-103 (For availability see N74-18252 09-20)

The effects of solar corpuscular radiation on atmospheric circulation in the lower layers of the atmosphere are discussed. A chart is developed to show the change in ground-level atmospheric pressure with respect to geomagnetically disturbed moment for several meteorological stations in the Northern Hemisphere during the winter season. The analysis indicated that even short range forecasts do not require any special allowance for the effects of solar activity, since they are reflected in the initial data and are automatically taken into consideration. Author

N74-18268 Joint Publications Research Service, Arlington, Va.
REPLIES TO ARTICLE ON THE POWER OF THE EFFECT OF CORPUSCULAR RADIATION FLUXES ON CIRCULATION

CONDITIONS IN THE LOWER LAYERS OF THE ATMOSPHERE c13

E. R. Mustel, B. I. Sazonov, and V. F. Loginov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 149-152 Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 104-105 (For availability see N74-18252 09-20)

The effects of solar corpuscular fluxes on the state of the earth's atmosphere in the lower layers are analyzed. Specific reference is made to the conditions existing under noticeable cyclone and anticyclone conditions. Variations in the cosmic particles reaching the atmosphere at various latitudes are discussed from the aspect of meteorological variations. The ability of high energy protons to redistribute masses of atmospheric air is also considered a significant factor in lower atmosphere conditions. Author

N74-18269 Joint Publications Research Service, Arlington, Va.
ON V. I. GUBIN'S ARTICLE ON THE COMPONENTS OF WIND VELOCITY

A. S. Dubov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 153-154 Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 106 (For availability see N74-18252 09-20)

A numerical analysis of the factors which influence the geostrophic wind was conducted. The restrictions which may lead to an erroneous evaluation of the velocity of the geostrophic wind as determined by the pressure gradient are discussed. The additional influence of the Coriolis parameter on the geostrophic wind is examined with respect to the quasihorizontal nature of large scale movements in the earth's atmosphere. Author

N74-18270 Joint Publications Research Service, Arlington, Va.
USE OF SNOW SURVEY PROCEDURES DEBATED c13

I. Ya. Liser and I. D. Kopanov *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 155-157 Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 107 (For availability see N74-18252 09-20)

Procedures for conducting snow surveys are discussed. The changes from previously established methods are analyzed. The primary change was that snow surveys using a triangle (in fields) or parallel lines (in forests) were replaced by surveys along linear topographical lines, which must cover all the typical topography in the given area. Author

N74-18271 Joint Publications Research Service, Arlington, Va.
THE SYSTEM OF OBSERVATIONS FOR THE FIRST WORLDWIDE GARP EXPERIMENT c13

V. P. Meleshko *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 158-169 refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 108-114 (For availability see N74-18252 09-20)

The organization, general description, and composition of the system of observations that has been suggested for the first worldwide GARP (Global Atmospheric Research Program) experiment in 1977 are presented. The subjects discussed are: (1) observation equipment required, (2) numerical experiments to investigate the properties of the observation means, (3) the recommended observation system, and (4) participation of various countries in the experiment. Author

N74-18272 Joint Publications Research Service, Arlington, Va.
FORECAST OF WEATHER AND AGROMETEOROLOGICAL CONDITIONS FOR EARLY WINTER 1973 (21 OCTOBER - 20 DECEMBER)

N. A. Aristov and V. A. Moiseychik *In its* Meteorology and Hydrology, No. 11, 1973 (JPRS-61249) 15 Feb. 1974 p 196-199 Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 11, 1973 p 125-126 (For availability see N74-18252 09-20)

The weather conditions and agrometeorological parameters for early winter 1973 in the U.S.S.R. are predicted. A map of the forecast air temperature and amount of precipitation during this period is developed. The extent and duration of snow cover is analyzed with respect to the predicted time for beginning agricultural activities. Author

N74-18273# National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, MARCH 1973
Key to Meteorological Records Documentation no. 5.4

Jan. 1974 100 p
Avail: NTIS HC $8.00

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths by a scanning radiometer on the NOAA 2 satellite. Author

N74-18274# National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, OCTOBER 1973
Key to Meteorological Records Documentation no. 5.4

Jan. 1974 94 p refs
Avail: NTIS HC $7.75

For abstract, see N74-18273.

N74-18275# National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, NOVEMBER 1973
Key to Meteorological Records Documentation no. 5.4

Jan. 1974 95 p
Avail: NTIS HC $7.75

For abstract, see N74-18273.

N74-18276# Centre d'Etude de l'Energie Nucleaire, Brussels (Belgium).
CHEMICAL ANALYSIS OF AIR POLLUTANTS

Apr. 1973 22 p refs
(BLG-480) Avail: AEC Depository Libraries HC $3.25

Analytical methods practical for air pollution control are discussed. Emission spectrography, neutron activation, X-ray fluorescence, and atomic absorption are described, with their application to the determination of metals in airborne particulate. Colorimetric, conductimetric, coulometric, flame photometric, and infrared absorptiometric pollution monitoring instruments are described. The practical methods for the estimation of SO2, NOx, CO, O3, and hydrocarbons are given.

Author (NSA)

N74-18277# Atomic Energy Commission, Washington, D.C. Div. of Biomedical and Environmental Research.
CHEMIST-METEOROLOGIST WORKSHOP

1973 48 p refs Workshop held at Fort Lauderdale, Fla., 15-19 Jan. 1973; cosponsored by AEC and EPA
(Wash-1217-73; Conf-730128) Avail: NTIS MF $1.45; SOD HC $0.45

Recommendations are presented for determining air pollution problems. The recommendations were made by four separate panels on: regional air studies, disposition and removal processes; global balances of chemical pollutants and radioactive gases; and photochemical and transformation modelling of pollutants.

NSA

N74-18278# Institut Royal Meteorologique de Belgique, Brussels.
PRACTICAL METHOD OF DECODING METEOROLOGICAL MESSAGES [SUR UNE METHODE PRACTIQUE DE DECODAGE DES MESSAGES METEOROLOGIQUES]

J. P. Stessel 1973 932 p In FRENCH
(Publ-Ser-B-74) Avail: NTIS HC $4.75

A practical method for machine translation of meteorological messages is presented. The structure of messages is analyzed and language properties (semantics, syntax) are discussed. The problem of message translation is dealt with in regard to the translator structure and the use of appropriate matrices or lists. In the latter case, a review of the required lists and syntactic rules is given together with the functions of the associated programs. The interaction between lists and programs is discussed with regard to the translation process. A practical example is detailed. ESRO

N74-18279# Stockholm Univ. (Sweden). Inst. of Meteorology.
A STUDY OF FALLOUT BY PRECIPITATION AROUND AN OIL-FIRED POWER PLANT

Lennart Granat and Henning Rodhe 25 May 1972 43 p refs
(Contract SWEDEPB-7-137/71-Dnr-2740-7-71)

(AC-22) Avail: NTIS HC $5.25

An investigation is presented of the distribution of deposition by precipitation around an oil-fired power plant on the west coast of Sweden. The measurements cover seven precipitation events during late fall. The samples were analyzed for sulfur, pH, alkalinity, and sodium. In most precipitation events an additional deposition (above the regional background level) of sulfur and acid was identified on the leeward side of the source. Compared to the background values, the observed increase was generally less than about 100%. As a longterm average the additional deposition of acid by precipitation, due to the power plant, is estimated to be not larger than 10 to 15% within the closest 15 km. A comparison with emitted quantities shows that 1 to 6% of the sulfur emitted during the precipitation was deposited within the first 15 km, corresponding to a travel time of 20 to 60 min. If the comparison is made using the total emission, including the dry periods, this fraction is only a few per mille. Author (ESRO)

N74-18280# Army Electronics Command, Fort Monmouth, N.J.

FOG CLEARING USING HELICOPTER DOWNDRAFTS: A NUMERICAL MODEL

Walter S. Nordquist, Jr. Dec. 1973 73 p refs

(DA Proj. 1T0-61102-B-53A)

(AD-771038; ECOM-5527) Avail: NTIS CSCL 04/2

A one-dimensional parameterized numerical model is presented which depicts the physical conditions attendant with the use of helicopter downdrafts for the creation of temporary clearings in fog. The results generated by the numerical model are compared to the data available from helicopter downdraft experiments. An example is given of the application of the model for investigation of the utility of the helicopter downdraft fog clearing technique for a particular set of meteorological conditions. Author (GRA)

N74-18281# Army Foreign Science and Technology Center, Charlottesville, Va.

DIMENSIONLESS CHARACTERISTICS OF TURBULENCE IN THE ATMOSPHERIC LAYER NEAR THE GROUND

A. S. Monin and A. M. Obukhov 16 Jul. 1973 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 93, no. 2, 1953

(AD-771384; FSTC-HT-23-229-73) Avail: NTIS CSCL 04/2

A universal law of velocity and temperature distribution is assumed to exist from dimensional considerations for regions near a smooth ground surface, neglecting Coriolis forces and molecular viscosity and thermal conductivity variations. Plots of data confirm this. GRA

N74-18282# Environmental Prediction Research Facility (Navy), Monterey, Calif.

HANDBOOK FOR FORECASTERS IN THE BAY OF BENGAL Final Report

Michael J. Cuming Sep. 1973 164 p refs

(AD-771379; ENVPREDRSCHFAC-Tech-Paper-7-73) Avail: NTIS CSCL 04/2

A literature search was conducted with the objective of assimilating information from widely diverse sources to provide the operational Navy forecaster with a single reference text for the Bay of Bengal. The approach adopted has been to describe and discuss the various large-scale and synoptic scale features and then to link all the components together in a description of the March of the Seasons. Mean climatic charts are presented and, wherever possible, typical satellite photographs are presented to illustrate various features. (Modified author abstract) GRA

N74-18283# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.

MICROPHYSICAL AND METEOROLOGICAL MEASUREMENTS OF FOG SUPERSATURATION

Richard D. H. Low Ft. Monmouth, N. J. ECOM Dec. 1973 24 p refs

(DA Proj. 1T1-61102-B-53-A)

(AD-771056; ECOM-5526) Avail: NTIS CSCL 04/2

It has been surmised that fog supersaturation lies well below a few tenths of one percent, but it cannot be directly measured at present. In this paper, theoretical and empirical equations are developed which render it possible to calculate fog supersaturation from simultaneous microphysical and meteorological measurements at regular time intervals. Such measurements became available on four occasions. With the aid of these equations, comparisons are carried out in terms of several supersaturation parameters, as well as in terms of the change in isobaric cooling. When the nature of the data is taken into consideration, the results of these comparisons appear to lend support to the use of these equations in the calculation of fog supersaturation. Author (GRA)

N74-18284# Army Foreign Science and Technology Center, Charlottesville, Va.

DISTRIBUTION OF LIQUID PRECIPITATION BY INTENSITY INTERVALS OVER THE USSR

Zh. D. Alibegova 6 Aug. 1973 13 p refs Transl. into ENGLISH from Tr. Glav. Geofiz. Obs. (Leningrad), no. 266, p 158-167

(AD-771202; FSTC-HT-23-196-73) Avail: NTIS CSCL 04/2

The report discusses the distribution of liquid precipitation by intensity intervals over the U.S.S.R. GRA

N74-18285# Stanford Research Inst., Menlo Park, Calif.

ASSESSMENT OF ECONOMIC IMPACT OF AIR POLLUTANTS ON VEGETATION IN THE UNITED STATES: 1969 AND 1971 Final Report

Harris M. Benedict, Clarence J. Miller, and Jean S. Smith Jul. 1973 103 p refs

(Contract EPA-68-02-0312; SRI Proj. LSU-1503)

(PB-224818/5GA; CRC-APRAC-CAPA-2-68-4) Avail: NTIS HC $4.25 CSCL 13B

The objectives of the entire study were to develop a model for estimating dollar losses to vegetation resulting from the effects of pollutants, and to make such estimates. This final report describes additional improvements in the model and gives estimates of vegetation losses in 1969 based on 1967 emission data. Losses to vegetation that occurred in 1971 were extrapolated from trends in emissions between 1963 and 1967 and from crop values of 1971. GRA

N74-18286# North Carolina State Univ., Raleigh.

PRECIPITATION VARIABILITY OVER NORTH CAROLINA

W. J. Saucier, A. H. Weber, and C. K. Bayne Aug. 1973 198 p refs

(Contract DI-14-31-0001-3833)

(PB-225123/9GA; UNC-WRRI-73-84; W74-01111; OWRR-A-061-NC(3)) Avail: NTIS HC $5.25 CSCL 04B

Variability of precipitation is analyzed in detail for records of 40 to 50 years or more. The probability of occurrence of wet or dry days is calculated for various thresholds of rainfall. Using the Freyerherm-Bark model, tables of initial and transitional probabilities and confidence limits are calculated. Tables of sequences of wet and dry days are also calculated. Computer programs and example problems are presented. Monthly total precipitation is calculated by station and tables and maps are given for the monthly means and of variance about the means. Long-term variations in precipitation were found in analyzing 10-year data series. Variations due to tropical storms are also analyzed. Conclusive evidence is presented that long-term variations do occur and affect nearby locations quite differently. GRA

N74-18287# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.

NAS REPORT ON TECHNOLOGICAL FEASIBILITY OF 1975-1976 MOTOR VEHICLE EMISSION STANDARDS. A CRITIQUE OF THE 1975-1976 FEDERAL AUTOMOBILE EMISSION STANDARDS FOR HYDROCARBONS AND OXIDES OF NITROGEN

May 1973 78 p refs

(Contract EPA-68-01-0402)

(PB-224863/1GA) Avail: NTIS HC $3.75; HC also available from NTIS $26.00/set of 8 reports as PB-224866-SET CSCL 13B

This report covers the results of a study, by the Panels on Emission Standards and Atmospheric Chemistry, Committee on Motor Vehicle Emissions, NAS, into the basis for the Federal Motor Vehicle Emission standards for hydrocarbons and oxides of nitrogen for 1975 and later model year vehicles. The study

covers the relationship between levels, emission sources, growth factors and computation of emission standards. GRA

N74-18288# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.

NAS REPORT ON TECHNOLOGICAL FEASIBILITY OF 1975-1976 MOTOR VEHICLE EMISSION STANDARDS. AUTOMOTIVE SPARK IGNITION ENGINE EMISSION CONTROL SYSTEMS TO MEET THE REQUIREMENTS OF THE 1970 CLEAN AIR AMENDMENTS

May 1973 115 p refs

(Contract EPA-68-01-0402)

(PB-224862/3GA) Avail: NTIS HC $4.25; HC also available from NTIS $26.00/set of a reports as PB-224866-SET CSCL 13B

This report summarizes the data available on the performance of emission control systems for spark-ignition engines that approach the degree of control required to meet the 1975 and 1976 automobile emission standards as required by the 1970 Clean Air Amendments. Emission control for conventional engines and also unconventional approaches for spark-ignition engines are discussed. The lead time necessary for production is also discussed. GRA

N74-18289# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.

NAS REPORT ON TECHNOLOGICAL FEASIBILITY OF 1975-1976 MOTOR VEHICLE EMISSION STANDARDS. A CRITIQUE OF THE 1975 FEDERAL AUTOMOBILE EMISSION STANDARD FOR CARBON MONOXIDE, NATIONAL ACADEMY OF SCIENCES

May 1973 70 p refs

(Contract EPA-68-01-0402)

(PB-224861/5GA) Avail: NTIS HC $3.50; HC also available from NTIS $26.00/set of 8 reports as PB-224866-SET CSCL 13B

This report covers the results of a study, by the Panel on Emissions Standards, Committee on Motor Vehicle Emissions, NAS, into the basis for the Federal motor vehicle carbon monoxide emission standard for 1975 and later model year vehicles. The study covers the measurement of ambient CO levels, health effects, growth factors, sources, air quality models and computation of emission standards. GRA

N74-18290# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

RADIATIVE EFFECTS OF CIRRUS CLOUDS M.S. Thesis

James R. Fleming Aug. 1973 78 p refs

(Grant NSF GA-36302)

(PB-224900/1GA; CSU-ATSP-207; ISBN-0067-0340) Avail: NTIS HC $6.00 CSCL 04A

The divergence of net radiation in a tropical atmosphere with cirrus clouds has been examined in terms of two bulk radiative properties of the cloud: shortwave optical thickness and broadband infrared emissivity. The net radiative energy budget of the tropical atmosphere over an ocean surface in the presence and absence of a cirrus cloud has been examined. The total net radiative energy loss of the atmosphere when a cirrus layer is present is shown to be 22% to 78% of the loss from a cloudless sky. This suppression of divergence generates in 24 hours an amount of energy which is 32% to 99% of the estimated net latent heat released to the atmosphere by precipitation processes in a cumulonimbus cloud. The divergence of net radiation through three layers encompassing the atmosphere is shown to be linearly dependent on the cirrus cloud's infrared emissivity and shortwave optical thickness. (Modified author abstract) GRA

N74-18291# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.

NAS REPORT ON TECHNOLOGICAL FEASIBILITY OF 1975-1976 MOTOR VEHICLE EMISSION STANDARDS Final Report, Jan. 1972 - Feb. 1973

15 Feb. 1973 156 p refs

(Contract EPA-68-01-0402)

(PB-224858/1GA) Avail: NTIS HC $4.75; HC also available from NTIS $26.00/set of 8 reports as PB-224866-SET CSCL 13B

Pursuant to Section 202(c) of the Clean Air Act, the Environmental Protection Agency contracted with the National Academy of Sciences to study the technological feasibility of the 1975-76 Federal Motor Vehicle Emission Standards. This is a report on that study as carried out by the Committee on Motor Vehicle Emissions and covers various topics including test procedures and certification, conventional control technology, alternative engines, in-use emissions and manufacturing, cost and producibility. GRA

N74-18292# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.

NAS REPORT ON TECHNOLOGICAL FEASIBILITIES OF 1975-1976 MOTOR VEHICLE EMISSIONS STANDARDS. MANUFACTURABILITY AND COSTS TO PROPOSED LOW-EMISSION AUTOMOTIVE ENGINE SYSTEMS

Jan. 1973 81 p refs

(Contract EPA-68-01-0402)

(PB-224864/9GA) Avail: NTIS HC $3.75; HC also available from NTIS $26.00 set of 8 reports as PB-224866-SET CSCL 13B

The Panel examined and reported the status of four domestic auto manufacturers' catalyst manufacturers' production plans for 1975-76 emission control system. Also examined was the potential production status of rotary, Diesel, and stratified charge engines. The Panel also provided an estimated resource impact of 1976 emission control systems. GRA

N74-18293# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.

IN-USE HEAVY DUTY GASOLINE TRUCK EMISSIONS. PART 1: MASS EMISSIONS FROM TRUCKS OPERATED OVER A ROAD COURSE Final Report

Melvin N. Ingalls and Karl J. Springer Feb. 1973 233 p refs

(Contract EPA-70-113)

(PB-224316/0GA; SWRI-AR-874; EPA-460/3-73-002a) Avail: NTIS HC $13.75 CSCL 13B

Mass emission tests were run on a number of gasoline powered trucks above 6,000-lb GVW during road driving and chassis dynamometer operation. A constant volume sampler was used to obtain samples during operation on a 7.24 mile course in San Antonio and during the entire 20 minute nine-mode FTP. The agreement between the road and dynamometer results, in terms of grams of emission per pound of fuel, was used to determine what road emissions would be from a larger, 145 vehicle, fleet that was subjected to similar CVS nine-mode FTP tests in the laboratory. Data was provided to assist in better estimating national impact from this source. A group of 25 trucks representing a variety of makes, displacements and gross vehicle weights were studied and extensive road and dynamometer hydrocarbon, carbon monoxide and oxides of nitrogen emission data are included. Also included are percent of time at various increments of engine speed and manifold vacuum and vehicle speed that define how each truck operated in traffic over the road course. Author (GRA)

N74-18294# Dow Chemical Co., Midland, Mich.

CHARACTERIZATION OF PARTICULATES AND OTHER NON-REGULATED EMISSIONS FROM MOBILE SOURCES AND THE EFFECTS OF EXHAUST EMISSIONS CONTROL DEVICES ON THESE EMISSIONS

James E. Gentel, Otto J. Manary, and Joseph C. Valenta Mar. 1973 217 p

(Contract EPA-70-126)

(PB-224243/6GA; APTD-1567) Avail: NTIS HC $13.00 CSCL 13B

The effect of emission control devices on the particulate emissions of an automotive power plant was investigated. Particulate mass emission rates were measured, as well as particle mass size distribution, carbon and hydrogen, tract metal, and benzoa-pyrene content of the particulate. Ammonia and aldehydes were measured in the exhaust gas condensate, and gaseous emissions were determined as a routine check on engine operating conditions. GRA

N74-18295# Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
SIMULATION OF THE CLIMATE AT THE LAST GLACIAL MAXIMUM USING THE NCAR GLOBAL CIRCULATION MODEL
Jill Williams, R. G. Berry, and W. M. Washington Mar. 1973 40 p refs Prepared in cooperation with Natl. Center for Atmospheric Res.
(PB-224927/4GA; INSTAAR-OP-5-73; NCAR-MS-2120-73-8) Avail: NTIS HC $4.00 CSCL 04B

The NCAR global circulation model was used to simulate global climatic conditions in January and July and at the Wurm/Wisconsin glacial maximum about 20,000 BP. The ice age simulations indicate that mean zonal wind strength in July in the middle latitudes of the Northern Hemisphere was comparable with present winter conditions. Cloud cover and precipitation were also analyzed. Changes in precipitation for the glacial maximum cases are mainly quantitative rather than affecting spatial distribution. A comparison of two January control cases indicated that slightly different boundary conditions did not greatly change the results of the simulation. (Modified author abstract) GRA

N74-18296# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs.
AIR POLLUTION ASPECTS OF EMISSION SOURCES: PRIMARY LEAD PRODUCTION. A BIBLIOGRAPHY WITH ABSTRACTS
Jun. 1973 34 p refs
(PB-224869/8GA; AP-126) Avail: NTIS HC $2.65; SOD HC $0.65 as EP4.9:126 CSCL 13B

This annotated bibliography on primary lead production pollution contains sections on emission sources, control methods, air quality measurements, atmospheric interaction, basic science and technology, effects, standards, and legal and administrative aspects. GRA

N74-18297# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs.
AIR POLLUTION ASPECTS OF EMISSION SOURCES: PRIMARY COPPER PRODUCTION. A BIBLIOGRAPHY WITH ABSTRACTS
Jun. 1973 46 p refs
(PB-224868/0GA; AP-125) Avail: NTIS HC $2.70; SOD HC $0.75 as EP4.9:125 CSCL 13B

The annotated bibliography on primary copper production pollution contains sections on emmission sources, control methods, measurement methods, air quality measurements, atmospheric interaction, basic science and technology, effects, standards, and legal and administrative aspects. GRA

N74-18298# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs.
AIR POLLUTION ASPECTS OF EMISSION SOURCES: PRIMARY ALUMINUM PRODUCTION. A BIBLIOGRAPHY WITH ABSTRACTS
Jun. 1973 62 p refs
(PB-224867/2GA; AP-119) Avail: NTIS HC $2.90; SOD HC $0.90 as EP4:119 CSCL 13B

The annotated bibliography on primary aluminum production pollution contains sections on emission sources, control methods, measurement methods, air quality measurements, atmospheric interaction, basic science and technology, effects, standards, legal and administrative aspects. GRA

N74-18299# Phillips Petroleum Co., Bartlesville, Okla. Research and Development Dept.
A MULTIPARAMETER OIL POLLUTION SOURCE IDENTIFICATION SYSTEM
John W. Miller Jul. 1973 175 p refs
(Contract EPA-68-01-0059)
(PB-224787/2GA; W74-00432; EPA-R2-73-221) Avail: NTIS MF $1.45; SOD HC $1.85 as EP1.13-2:73-221 CSCL 13B

The feasibility of oil pollution source identification is demonstrated on eighty crude oils from the world's major oil fields. Measurements of fifteen diagnostic parameters were made on the 600 +F fraction of the crude oil samples. Of the fifteen parameters studied it was demonstrated that six were sufficient to distinguish among the crude oils. These parameters are carbon and sulfur isotopic composition, sulfur, nitrogen, vanadium and nickel contents. The influence of weathering on the parameters was studied. A statistical procedure based on multivariate normal analysis was developed to compare an unknown with a data library and to give an unbiased match of the unknown with a known based on the precision of the measurement methods. GRA

N74-18300# Environmental Protection Agency, Research Triangle Park, N.C.
COMPILATION OF AIR POLLUTANT EMISSION FACTORS (SECOND EDITION)
Apr. 1973 288 p refs Revised
(PB-223996/0GA; AP-42) Avail: NTIS MF $1.45; SOD HC $3.55 as EP4.9:42 CSCL 13B

Emission data obtained from source tests, material balance studies, engineering estimates, etc., have been compiled for use by individuals and groups responsible for conducting air pollution emission inventories. Emission factors given cover most of the common emission categories: fuel combustion by stationary and mobile sources; combustion of solid wastes; evaporation of fuels, solvents, and other volatile substances; various industrial processes; and miscellaneous sources. When no source test data are available, these factors can be used to estimate the quantities of primary pollutants (particulates, carbon monoxide, sulfur dioxide, nitrogen oxides, and hydrocarbons) being released from a source or source group. Author (GRA)

N74-18301# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs.
AIR QUALITY DATA FOR METALS 1968 AND 1969 FROM THE NATIONAL AIR SURVEILLANCE NETWORKS
Jun. 1973 182 p refs
(PB-224823/5GA; APTD-1467) Avail: NTIS HC $11.25 CSCL 13B

Particulate pollutant data gathered during 1968 and 1965 by the cooperating stations of the National Air Surveillance Networks provide the basis for listing the urban and nonurban concentrations of 12 metallic components of suspended particulate matter. The data are presented as cumulative frequency distributions, including the number of valid samples taken, the minimum value, the maximum value, the arithmetic mean, the geometric mean, and the standard deviation or as a composite concentration value for each sites for each of the four quarters of the calendar year; a yearly average is reported whenever valid data for all four quarters are obtained. (Author) GRA

N74-18302# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs.
AIR QUALITY DATA FOR ORGANICS 1969 AND 1970 FROM THE NATIONAL AIR SURVEILLANCE NETWORKS
Jun. 1973 34 p refs
(PB-224822/7GA; APTD-1465) Avail: NTIS HC $3.75 CSCL 13B

Particulate pollutant data gathered during 1969 and 1970 by the cooperating stations of the National Air Surveillance Networks provide the basis for listing the concentrations of the organic fraction of suspended particulate matter. The total amounts of Benzene soluble organic compounds and benzo(a)pyrene, a polynuclear aromatic hydrocarbon present in the benzene-soluble fraction, were measured in the laboratory using particulate samples collected at urban and nonurban sites. The data are presented in a quarterly composite format. (Modified author abstract) GRA

N74-18303# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.
NAS REPORT ON TECHNOLOGICAL FEASIBILITY OF 1975-1976 MOTOR VEHICLE EMISSIONS STANDARDS. FEASIBILITY OF MEETING THE 1975-1976 EXHAUST EMISSION STANDARDS IN ACTUAL USE
Jun. 1973 251 p refs
(Contract EPA-68-01-0402)
(PB-224865/6GA) Avail: NTIS HC $6.25 HC also available from NTIS $26.00/set of 8 reports as PB-224866-SET CSCL 13B

It is examination of feasibility the panel considered the

durability of proposed control systems, deterioration of components and adjustment, contamination of catalysts by fuels and labels, adequacy of the service industry, adequacy of replacement parts, the level of emissions from cars with inoperative control systems, and the availability of state programs for ensuring proper maintenance. The document also contains a Minority Report on analytical investigation of feasibility of meeting the 1975-1976 exhaust emission standards in actual use. GRA

N74-18304# Washington Univ., Seattle.
A CRITICAL REVIEW OF MATHEMATICAL DIFFUSION MODELING TECHNIQUES FOR PREDICTING AIR QUALITY WITH RELATION TO MOTOR VEHICLE TRANSPORTATION Final Report
Donna V. Lamb, Franklin L. Badgley, and August T. Rossano Jun. 1973 96 p refs Sponsored by Wash. State Dept. of Highways, Olympia
(PB-224656/9GA; RPR-12.1) Avail: NTIS HC $3.75 CSCL 13B

At the request of the Washington State Department of Highways a literature review was undertaken to assess the State-of-the-art in air quality modeling as related to motor vehicle transportation problems. In addition to reviewing the published literature several private companies and governmental agencies with available models were contacted as were individuals working in the field. Models which were available for review are described and examined with respect to identification of latest State-of-the-art characteristics, model applicability, and limitations. Recommendations on the use of air quality diffusion models are offered. Author (GRA)

N74-18305# National Environmental Research Center, Research Triangle Park, N.C. Control Systems Lab.
ATMOSPHERIC EMISSIONS FROM THE PETROLEUM REFINING INDUSTRY Final Report
L. L. Laster Aug. 1973 58 p refs
(PB-225040/5GA; EPA-650/2-73-017) Avail: NTIS HC $3.50 CSCL 07A

This report summarizes the air pollution problems of the petroleum refining industry, with emphasis on gaseous emissions. A general outline of the refining processes, sources and types of pollutant emissions, and present and needed control methods is provided. GRA

N74-18306# Instra-Tech, Inc., Fullerton, Calif.
DEVELOPMENT OF IMPROVED SYSTEMS FOR OBTAINING TIME INTEGRATED MEASUREMENTS OF SO2, NO2, NOx, AND OTHER POLLUTANTS
Victor R. Huebner Jan. 1973 69 p refs
(Contract EPA-68-02-0318)
(PB-225125/4GA; EPA-R2-73-207) Avail: NTIS HC $5.50 CSCL 13B

The aims were to develop methods of detecting light emitted by chemiluminescene which are more stable and reliable than those presently used and to develop a simplified method of time-intergrating and recording the outputs of chemiluminescence instruments. Primary effort was placed on elimination of the photomultiplier tube system by using photographic film as the detector as well as recorder. When this approach proved to be unsuccessful, digital photon counting methods were explored. This approach was quite successful. A system was developed that amplified each photoelectron, discriminated against noise pulses, accumulated all the photon counts, and displayed the sum of the photon counts on a 5 x 7 light emitting diode display. GRA

N74-18307# Wisconsin Univ., Madison. Water Resources Center.
RADAR INVESTIGATION OF SUMMERTIME LAND/LAKE RAINFALL VARIATIONS OVER LAKE MICHIGAN Technical Completion Report
John F. Chandik and Walter A. Lyons 1973 59 p refs
(Contract DI-14-31-0001-3550)
(PB-225430/8GA; W74-01661; OWRR-A-036-WIS(1)) Avail: NTIS HC $3.50 CSCL 04B

A detailed analysis of gain-stepped WSR-57 radar data shows that warm season precipitation patterns over the southern basin of Lake Michigan (based on areal echo frequency distributions) are on the whole unaffected by the presence of a large cold water body. While precipitation echo frequencies associated with air mass shower activity are 13% lower over the lake compared to those over the land portion of the basin, air mass precipitation accounts for less than 10% of all warm season precipitation over the lake portion of the southern Lake Michigan basin. However, when radar echoes for all warm season precipitation types, e.g., cold front, squall line, and overrunning are investigated, overlake echo counts are slightly greater than land echo counts for comparative land and lake test areas. GRA

N74-18308# Naval Weather Service Command, Washington, D.C.
SOUTH INDIAN TROPICAL CYCLONE STRIKE PROBABILITIES. VOLUME 1: 24-HOUR MOVEMENT. VOLUME 2: 48-HOUR MOVEMENT. VOLUME 3: 72-HOUR MOVEMENT
Harold L. Crutcher and Lee R. Hoxit Dec. 1973 101 p refs
(AD-771866) Avail: NTIS CSCL 04/2

Probabilities relating to the future movement of South Indian tropical cyclones are presented. The probabilities are based on observational data of successive 12-hour positions of the centers of these storms. The data are stratified into five seasons: December, January, February, March, April and May-November. Geographical areas are defined by five-degree latitude-longitude squares. The probabilities are computed assuming the initial storm position or origin is always at the center of the square and the target areas are always circular areas with radii of one, two and three degrees latitude which are also located at the center of the squares. These probabilities indicate the change of the storm center being within the target areas at the end of specified time intervals. (Modified author abstract) GRA

N74-18309# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USE OF EMPIRICAL INFLUENCE FUNCTIONS FOR THE PREDICTION OF METEOROLOGICAL FIELDS
V. I. Gubin 12 Nov. 1973 124 p refs Transl. into ENGLISH of the Publ. "Ispolzovaniye Empiricheskikh Funktsii Vliyaniya dlya Prognoza Meteorologicheskikh Polei" USSR, 1970 p 1-111
(AD-771888; FTD-MT-24-432-73) Avail: NTIS CSCL 04/2

The report examines numerical solutions to the equations of thermodynamics. Diagrams of two- and five-level models of the atmosphere are investigated; the calculation of the ageostrophic wind and its account with a prediction of the pressure field is given. GRA

N74-18310# Army Missile Command, Redstone Arsenal, Ala.
ON THE DURATION OF WIDESPREAD FOG AND LOW CEILING IN CENTRAL EUROPE AND SOME ASPECTS OF PREDICTABILITY
O. M. Essenwanger 1 Aug. 1973 59 p refs
(DA Proj. 1T1-61102-B-53A)
(AD-771934; RR-73-9) Avail: NTIS CSCL 04/2

The duration of adverse weather over Central Europe has been analyzed. After a definition of adverse weather, the duration in hours and days is given. While the median of the frequency for the hours fluctuates between 4 to 8 hours in winter at a single station, the duration in days ranges in the average between 2 and 3 hours. In 10% of the cases, adverse weather exceeds between 16 to 24 hours, while 10% of the cases lasts more than 4 to 7 days in the winter months. Station combinations to assess the duration of adverse weather over an extended area provide the same result in days. Several models have been considered and speculative numbers were obtained. Evaluation is based on the large-scale weather patterns over Central Europe (Grosswetteriagen (GWL)) and their relationship with adverse weather. (Modified author abstract) GRA

N74-18311# Air Pollution Control District, Los Angeles, Calif.
AIR POLLUTION ENGINEERING MANUAL, SECOND EDITION
John A. Danielson May 1973 992 p refs
(PB-225132/0GA; AP-40) Avail: NTIS MF $1.45; SOD HC $13.10 as EP4.9:40-2 CSCL 13B

Control of air pollution at specific sources is discussed. The practical engineering problems of design and operation associated with the many sources is discussed. The practical engineering

problems of design and operation associated with the many sources of air pollution are emphasized. These sources include metallurgical, mechanical, incineration, combustion, petroleum, chemical, and organic solvent emitting processes. Topics specifically discussed are the control of photochemically reactive organic solvent emissions, reducing the formation of oxides of nitrogen in combustion, and improved afterburner control devices. An index is included. Author (GRA)

N74-18312# Defense Documentation Center, Alexandria, Va.
ENVIRONMENTAL POLLUTION: AIR POLLUTION (EXHAUST GASES) Report Bibliography, Jan. 1971 - Jul. 1973
Dec. 1973 94 p refs
(AD-771710; DDC-TAS-73-77) Avail: NTIS CSCL 13/3

The bibliography comprises citations of unclassified reports dealing with exhaust gases in a series of bibliographies on air pollution. Topics discussed include air pollution from exhaust gases emanating from ground and air transportation. There are also included some references to exhaust systems of jet engines, helicopters, turbojet engines, and rocket motors. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number Indexes are included.
Author (GRA)

N74-18313# Esso Research and Engineering Co., Linden, N.J. Government Research Lab.
POTENTIAL POLLUTANTS IN FOSSIL FUELS
E. M. Magee, H. J. Hall, and G. M. Varga, Jr. Jun. 1973 292 p refs
(Contract EPA-68-02-0629)
(PB-225039/7GA; GRU-2DJ-73; EPA-R2-73-249) Avail: NTIS HC $6.50 CSCL 13B

This survey presents the composition of typical U.S. fossil fuels by source location, and the extent to which the selection of coals and crude oils by geographic source can be expected to affect their composition in trace elements. The first section deals with coals produced and consumed in the United States. A section on petroleum and shale oil includes domestic crudes and crudes from nations which export to this country. The number of elements for which statistical data on composition and geographical location exist is entirely different for crude oil and for coal. Good data and useful correlations with source locations are available for petroleum, for sulfur, nitrogen and nickel/vanadium, but not for other potential pollutants. A large body of data is available for trace elements in coal, and is examined herein. For both coal and petroleum, however, the level of trace elements present is relatively low sot that methods of sample selection and sample handing, prior to analysis, can and do present major complications in the interpretation of results. GRA

N74-17721 Meteorological Office, Bracknell (England).
TURBULENCE AT MEDIUM AND HIGH FLIGHT LEVELS
S. G. Cornford *In* AGARD Flight in Turbulence Nov. 1973 14 p refs (For availability see N74-17720 09-02)

N74-17722* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROBLEMS IN THE SIMULATION OF ATMOSPHERIC BOUNDARY LAYER FLOWS
George H. Fichtl *In* AGARD Flight in Turbulence Nov. 1973 14 p refs (For availability see N74-17720 09-02)

N74-17723 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
TURBULENCE AND MESOSCALE HORIZONTAL TEMPERATURE GRADIENTS IN THE LOWER STRATOSPHERE
Ian MacPherson *In* AGARD Flight in Turbulence Nov. 1973 15 p refs (For availability see N74-17720 09-02)

N74-17724 Tennessee Univ. Space Inst., Tullahoma.
REVIEW OF DATA AND PREDICTION TECHNIQUES FOR WIND PROFILES AROUND MANMADE SURFACE OBSTRUCTIONS
Walter Frost *In* AGARD Flight in Turbulence Nov. 1973 18 p refs (For availability see N74-17720 09-02)
(Contract NAS8-27387)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-18314# European Space Research and Technology Center, Noordwijk (Netherlands).
DEVELOPMENT OF A STAR MAPPER SENSOR
B. Morgenstern 1973 8 p refs Presented at the 4emes Journees d'Optique Spatiale, Marseille, 6-8 Nov. 1973
Avail: NTIS HC $4.00

A star mapper sensor to be used as an attitude measurement system on spinning satellites is described. The sensor is a device consisting of a lens which images a part of the sky onto a series of slit shaped detectors. By means of the satellite spinning motion, the sensor field of view scans a certain belt of the celestial sphere. Whenever a star within this belt is imaged onto one of the detectors, a pulse is generated and transmitted to ground. On the ground, two different functions are performed: (1) star recognition by computing the angular separation of each pair of two stars and comparing it with catalog star data and (2) attitude determination by computing the star position within the sensor field of view. Author (ESRO)

N74-18315# OST/FAA Flight Service Station Evaluation Team, Washington, D.C.
A PROPOSAL FOR THE FUTURE OF FLIGHT SERVICE STATIONS. VOLUME 1: SUMMARY Final Report
Aug. 1973 73 p
(PB-225052/0GA) Avail: NTIS HC $3.50 HC also available from NTIS $11.00/set of 5 reports as PB-225051-SET CSCL 17G

A brief FSS program history is presented and the problem is defined. Present system costs, system user descriptions, evaluation methodology, functional recommendations, proposed automated system concept description and costs, manpower estimates, implementation concept, and funding requirements are summarized. An appendix containing the letters received from user organizations pertaining to the report is included.
Author (GRA)

N74-18316# OST/FAA Flight Service Station Evaluation Team, Washington, D.C.
A PROPOSAL FOR THE FUTURE OF FLIGHT SERVICE STATIONS. VOLUME 2: COST ANALYSIS OF THE PRESENT FLIGHT SERVICE STATION SYSTEM Final Report
Aug. 1973 34 p refs
(PB-225053/8GA) Avail: NTIS HC $3.00 HC also available from NTIS $11.00/set of 5 reports as PB-225051-SET CSCL 17G

Total costs of the present FSS system are developed and allocated among the major functions performed. Unit service costs are derived. Total costs are extrapolated to determine the expense of expanding the present system (without changes in the mode of operation) to meet the projected 1983 demand.
Author (GRA)

N74-18317# OST/FAA Flight Service Station Evaluation Team, Washington, D.C.
A PROPOSAL FOR THE FUTURE OF FLIGHT SERVICE STATIONS. VOLUME 3: FUNCTIONAL ANALYSIS OF THE FSS SYSTEM Final Report
Aug. 1973 47 p
(PB-225054/6GA) Avail: NTIS HC $3.00 HC also available from NTIS $11.00/set of 5 reports as PB-225051-SET CSCL 17G

The major FSS functions are analyzed from the perspectives of benefits and beneficiaries, primary purpose and components of each function, alternate approaches, and the impacts of continuing of eliminating each. Recommendations are made to continue eight functions and transfer or eliminate four.
Author (GRA)

N74-18318# OST/FAA Flight Service Station Evaluation Team, Washington, D.C.

A PROPOSAL FOR THE FUTURE OF FLIGHT SERVICE STATIONS. VOLUME 4: PROPOSED AUTOMATED FSS SYSTEM CONCEPT Final Report
Aug. 1973 62 p refs
(PB-225055/3GA) Avail: NTIS HC $3.50 HC also available from NTIS $11.00/set of 5 reports as PB-225051-SET CSCL 17G

The proposed automated FSS system concept is described, requirements for system sizing and configuration to meet 1983 forecast demand are developed, hardware and software configurations are detailed to the extent necessary for system cost estimates, and staffing requirements are derived. Author (GRA)

N74-18319# OST/FAA Flight Service Station Evaluation Team, Washington, D.C.
A PROPOSAL FOR THE FUTURE OF FLIGHT SERVICE STATIONS. VOLUME 5: IMPLEMENTATION CONCEPT FOR THE PROPOSED SYSTEM Final Report
Aug. 1973 27 p
(PB-225056/1GA) Avail: NTIS HC $3.00 HC also available from NTIS $11.00/set of 5 reports as PB-225051-SET CSCL 17G

An implementation concept and schedule is presented for the gradual transition from the current system to the proposed. Implementation objectives are developed, facilities and equipment projects are described along with funding requirements, engineering and development considerations are summarized, and manpower requirements are estimated. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-18320*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRICAL HEATING TESTS OF URANIUM DIOXIDE EXTERNAL FUEL CONFIGURATION AT EMITTER TEMPERATURE OF 1900 K
Dominic C. Dilanni and John T. Mayer Washington Mar. 1974 30 p refs
(NASA-TM-X-2994; E-7554) Avail: NTIS HC $3.25 CSCL 18J

Testing of two fuel clad specimens for thermionic reactor application is described. The annular UO2 fuel was clad on both sides with tungsten; heat rejection was radially inward. The tests were intended to study inner clad stability, fuel redistribution, and fuel melting problems. The specimens were tested in a vacuum chamber using electron bombardment heating. Fuel structural changes were studied using periodic gammagraphs and posttest metallography. The first specimen test was terminated at 50 hours because of a braze failure. The second specimen was tested for 240 hours when an outer clad leak developed due to a tungsten-water reaction. The fuel developed numerous cracks on cooldown but the inner clad remained dimensionally stable. The fuel cover gas did not impede the rate of fuel redistribution. Posttest examination showed the fuel had not melted during operation. Author

N74-18321*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OFF-DESIGN TEMPERATURE EFFECTS ON NUCLEAR FUEL PINS FOR AN ADVANCED SPACE-POWER-REACTOR CONCEPT
Kenneth J. Bowles Washington Mar. 1974 24 p refs
(NASA-TM-X-2981; E-7606) Avail: NTIS HC $3.00 CSCL 18J

An exploratory out-of-reactor investigation was made of the effects of short-time temperature excursions above the nominal operating temperature of 990 C on the compatibility of advanced nuclear space-power reactor fuel pin materials. This information is required for formulating a reliable reactor safety analysis and designing an emergency core cooling system. Simulated uranium mononitride (UN) fuel pins, clad with tungsten-lined T-111 (Ta-8W-2Hf) showed no compatibility problems after heating for 8 hours at 2400 C. At 2520 C and above, reactions occurred in 1 hour or less. Under these conditions free uranium formed, redistributed, and attacked the cladding. Author

N74-18322# Gulf General Atomic, San Diego, Calif. Fusion Staff.
CONTROLLED THERMONUCLEAR RESEARCH PROGRAM Summary Progress Report, 1 Aug. 1972 - 31 Jul. 1973
Tihiro Ohkawa 15 Sep. 1973 161 p refs
(Contract AT(04-3)-167)
(GULF-GA-A-12690) Avail: NTIS

Plasma diffusion studies are briefly described in terms of the temperature dependence of neoclassical diffusion and classical diffusion resulting from thermal equilibrium fluctuations. Diffusion in the octupole field only is also described. Author (NSA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-18323* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CRYOGENIC GYROSCOPE HOUSING Patent
Wilhelm Angele, inventor (to NASA) Issued 9 Oct. 1973 10 p Filed 13 Jun. 1972 Supersedes N72-27731 (10 -18, p 2467)
(NASA-Case-MFS-21136-1; US-Patent-3,763,708; US-Patent-Appl-SN-262430; US-Patent-Class-74-5.7; US-Patent-Class-308-10) Avail: US Patent Office CSCL 20L

A cryogenic gyroscope housing having gas spin-up means provided in annular discs inserted between housing shells is described. A circumferential recess in the inner edges of the discs at their juncture serves as the gas spin-up channel, and recesses in the discs at their junctures with the shells form suction channels. The discs also have inlet and outlet ports communicating with the spin-up channel and exhaust slots communicating with the suction channels. Mating surfaces of the discs and housing shells are held in position by optical contact at the equational plane of the housing. Suspension electrodes and thin-film readout loops are disposed in shells. A centering band and clamp rings provide for proper alinement and placement of parts in formation of optical contact joints.
Official Gazette of the U.S. Patent Office

N74-18324# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
STANDARD REFERENCE MATERIALS: ELECTRICAL RESISTIVITY OF ELECTROLYTIC IRON, SRM 797, AND AUSTENITIC STAINLESS STEEL, SRM 798, FROM 5 TO 280 K Final Report
J. G. Hust Feb. 1974 21 p refs
(NBS-SP-260-47; LC-74-600002) Avail: NTIS CSCL 20L

Electrical resistivity data are presented for characterized electrolytic iron, SRM 797, and austenitic stainless steel, SRM 798, at temperatures from 5 to 280 K. Resistivities at ice and liquid helium temperatures were determined for 22 randomly selected iron specimens and the same number of steel specimens. These data indicate that the effect of material variability is about 1% for each of these SRM's. Author

N74-18325*# Rensselaer Polytechnic Inst., Troy, N.Y. Tribology Lab.
A THERMAL, THERMOELASTIC, AND WEAR ANALYSIS OF HIGH-ENERGY DISK BRAKES
F. E. Kennedy, J. J. Wu, and F. F. Ling Jan. 1974 53 p refs (Grant NGR-33-018-152)
(NASA-CR-134507) Avail: NTIS HC $5.75 CSCL 20K

A thermomechanical investigation of the sliding contact problem encountered in high-energy disk brakes is described. The analysis includes a modelling, using the finite element method of the thermoelastic instabilities that cause transient changes in contact area to occur on the friction surface. In order to include

the effect of wear at the contact surface, a wear criterion is proposed that results in the prediction of wear rates for disk brakes that are quite close to experimentally determined wear rates. The thermal analysis shows that the transient temperature distribution in a disk brake assembly can be determined more accurately by use of this thermomechanical analysis than by a more conventional analysis that assumes constant contact conditions. It also shows that lower, more desirable, temperatures in disk brakes can be attained by increasing the volume, the thermal conductivity, and, especially, the heat capacity of the brake components. Author

N74-18326# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON A METHOD OF SOLVING PROBLEMS OF DIFFRACTION BY AXISYMMETRIC BODIES
E. M. Chechetkina [1974] 8 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1: Mat. i Mekhan (Moscow), no. 6, 1973 p 107-113
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

Some methods of solving problems of plane wave diffraction by different obstacles are presented. A time dependent change in the resultant force is obtained for the problem of acoustic step wave diffraction by a cylinder endface. A method is proposed for computing the nonstationary pressure field during plane wave diffraction by axisymmetric bodies of diverse shapes using an analytical representation of the solution in the neighborhood of the wave front and a further numerical computation of the residuals. The principle part of the solution of the problem is constructed for diffraction by a cylinder and a difference scheme for computing the residuals is also presented, its stability is proved, and the efficiency of the scheme is illustrated by graphs. Author

N74-18327# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE EFFICIENCY OF PARAMETRIC CONVERSION IN HIGH QUALITY OPTICAL CAVITIES
M. M. Sushchik and V. M. Fortus [1973] 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (Gorkiy), v. 16, no. 10, 1973 p 1522-1529
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The stationary state of a two cavity parametric light generator is found by focusing of the pumping beam in the approximation of a given field configuration generated in the driver. The dependence of the efficiency of the driver in this state on the cavity and pumping field parameters is investigated. In particular, it is shown that the amplitude and phase modulation of the pumping beam, related to its focusing, do not result in diminution of the efficiency in some cases. Author

N74-18328# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
DESIGN STUDY OF SUPERCONDUCTING 5 TESLA DIPOLE MAGNETS FOR MGD GENERATORS
W. Elsel and H. Muntenbruch Dec. 1972 99 p refs In GERMAN; ENGLISH summary
(IPP-IV-53) Avail: AEC Depository Libraries HC $7.00

A general design concept for a 5 tesla dipole magnet to be used in a 10 MW MHD generator was developed. The solution allows the linear dimensions of the magnet to be increased or decreased by a factor of about 2 without need of major modifications. The required dimensions and properties of the magnet are: rated field strength = 5 tesla; magnetic length = 2 m; uniformity-in a volume 50 cm in diameter and about 2 m in length deviations from the rated field strength should be less than 5%; room temperature bore-circular with a diameter of 70 cm or square with sides 60 cm long. The investigations provided the basic calculations and drawings for designing the magnet system, power supply system, cryogenic system and the control and safety facilities. Various conductors, coil geometries, winding concepts, and design principles were compared. The forces in the coils as well as in the structure were calculated and estimates concerning the quench behavior were made. Author (NSA)

N74-18329# Rome Univ. (Italy). Inst. of Physics.
DETERMINATION OF THE COMPLEX DIELECTRIC CONSTANT BY CAVITY PERTURBATION METHODS
A. Bonincontro and C. Cametti 10 Sep. 1973 28 p refs
(Nota-Interna-489) Avail: NTIS HC $4.50

Perturbation theories were developed for cavities of general shapes in which small dielectric samples were placed. The dielectric properties of the sample (for low loss dielectric materials) were determined in terms of the frequency shift and change in the Q factor using a perturbation method developed by Bethe and Swinger. The applicability of the cavity perturbation theory for measuring the dielectric constant of high loss materials by using a TE sub 011 cavity with a coaxial cylinder is discussed. ESRO

N74-18330# Admiralty Research Lab., Teddington (England).
ACOUSTIC FINITE ELEMENT ANALYSIS OF AXISYMMETRIC FLUID REGIONS
J. H. James Aug. 1973 21 p refs
(ARL/R/R-4; BR37560; R-8.5/JHJ) Avail: NTIS HC $4.25

The linear axisymmetric triangular element is used to study the acoustics of axisymmetric fluid regions subject to mixed boundary conditions. Asymmetric acoustic fields are represented by means of Fourier series expansions in the circumferential coordinate. Author (ESRO)

N74-18331# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
IR TO VISIBLE UPCONVERSION Final Report (Part 2), 1 Apr. - 1 Oct. 1973
R. R. Zucca and T. C. Lim 10 Dec. 1973 70 p refs
(Contract F04701-71-C-0364; ARPA Order 1629)
(AD-771592; SC517.26FR; SAMSO-TR-73-377) Avail: NTIS CSCL 20/6

The report contains two approaches to the problem of infrared-to-visible conversion for thermal imaging--IR-induced luminescence in a phosphor (ZnS) and a semiconductor heterostructure. (Modified author abstract) GRA

N74-18332# Clarkson Coll. of Technology, Potsdam, N.Y.
MAGNETIZATION OF LUTENTIUM IRON GARNET NEAR THE CRITICAL POINT
A. A. Stelmach, E. E. Anderson, and S. Arajs 20 Dec. 1972 7 p refs Repr. from J. Phys. Chem. Solids London v. 34, 1973 p 1343-1346
(Contract N00014-70-A-0311-0001)
(AD-771337; TR-3-73) Avail: NTIS CSCL 20/12

A study has been made of the critical magnetic properties of lutetium iron garnet. Values of the critical exponents, beta, delta, and gamma were seen to fulfill the scaling relation, beta(delta-1) = gamma, within the limits of experimental error. The critical temperature, obtained from the kink-point plot of applied magnetic field vs break-point temperature, was reaffirmed through use of the Kouvel-Fisher analysis. Author (GRA)

N74-18333# Delaware Univ., Newark. Dept. of Mathematics.
TRANSITION PROBLEMS FOR THE HELMHOLTZ EQUATION
R. Kittappa Oct. 1973 194 p refs
(Grant AF-AFOSR-1794-69; AF Proj. 9749)
(AD-771589; AFOSR-73-2204TR; Rept-1794-9) Avail: NTIS CSCL 20/1

The transition problem for time harmonic acoustic diffraction for two homogeneous media is considered. The source is in an infinite medium in which the second medium is immersed. The interface is either Lyapunov or piecewise Lyapunov. The problem is cast into weakly singular integral equations and regularized integral equations for the total field and its normal derivative. The Neumann series obtained by a simple iteration is shown to converge for some conditions. The iteration appears simpler than the corresponding Born Approximation method. (Modified author abstract) GRA

N74-18334# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
PROGRAM FOR THE MEASUREMENT OF ENVIRONMENTAL NOISE Final Report, Jul. 1972 - Sep. 1973
Dwight E. Bishop Sep. 1973 232 p refs

(Contract DOT-OS-20103)
(PB-225305/2GA; BBN-2424; DOT-TST-74-4) Avail: NTIS HC $5.75 CSCL 13B

Plans call for a large number of measurements to be made at a wide variety of sites throughout the country. The noise measurements would be taken in places where people live, during the times of actual occupancy and activity. The measurements would be made either continuously or on a sample basis, over complete 24-hour periods in residential areas, and over daily periods of usage or occupancy for nonresidential areas. The use of new types of acoustic instrumentation that are capable of gathering data over 24-hour periods without servicing or need for high technical skills in data readout was introduced. GRA

N74-18335# California Inst. of Tech., Pasadena.
COMPONENTS FOR INTEGRATED OPTICS
Sasson Somekh and Amnon Yariv Aug. 1973 156 p refs
(Grant DA-ARO(D)-31-124-73-G64; ARPA Order 675)
(AD-771152; AROD-10242-9-P) Avail: NTIS CSCL 20/6

Recent progress in the fabrication of low attentuation optical fibers raises the attractive possibility of optical communications via these waveguides. Integration of different optical functions on one substrate in the form of optical circuits will form ideal terminals for such a communication network. The authors discuss the theory, fabrication and performance of a few building stones of such optical circuits. Optical directional couplers capable of coupling light from one channel to another are described and their use as switches is discussed. Distributed feedback for integrated lasers is analyzed. Laser action in a GaAs waveguide, in which distributed feedback was supplied by corrugations fabricated on the surface, is described. Longitudinal and transverse mode control of such a laser is also discussed.
Author (GRA)

N74-18570 Joint Publications Research Service, Arlington, Va.
THE CENTENARY OF THE JOURNAL OF EXPERIMENTAL AND THEORETICAL PHYSICS AND THE ROLE OF JOURNALS IN THE DEVELOPMENT OF SCIENCE
P. L. Kapitsa *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 15-24 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 13-21 (For availability see N74-18567 09-34)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-18336*# California Univ., Berkeley. Space Sciences Lab.
ENERGETIC PARTICLE FLUX EXPERIMENT (IMP F AND G) Final Report, 28 Jan. 1965 - 30 Jun. 1971
K. A. Anderson Apr. 1973 13 p refs
(Contract NAS5-9091)
(NASA-CR-132869; SSL-Ser-14-Issue-19) Avail: NTIS HC $4.00 CSCL 20H

The data reduction procedures and programs for analysis of the IMP F and G energetic particle flux experiments are summarized. The IMP-F experiment contained two thin-window Geiger-Mueller detectors and an ionization chamber. There were two IMP-G experiments: one with six Geiger-Mueller detectors and an ionization chamber, and the other with two funnel mouthed channeltrons in a parallel plate electrostatic analyzer. These experiments measured particles in the energy range above 20 keV (IMP-F) and above approximately 5 keV (IMP-G). A bibliography is presented of papers containing the scientific results. These data were predominantly used for the study of low energy solar particles from flares. Author

N74-18337*# Texas A&M Univ., College Station. Dept. of Physics.
PHASE MATRIX INDUCED SYMMETRICS FOR MULTIPLE SCATTERING USING THE MATRIX OPERATOR METHOD
Stephen J. Hitzfelder and George W. Kattawar 21 Nov. 1973 18 p refs
(Grant NGR-44-001-117)
(NASA-CR-137080; Rept-8) Avail: NTIS HC $4.00 CSCL 20H

Entirely rigorous proofs of the symmetries induced by the phase matrix into the reflection and transmission operators used in the matrix operator theory are given. Results are obtained for multiple scattering in both homogeneous and inhomogeneous atmospheres. These results will be useful to researchers using the method since large savings in computer time and storage are obtainable. Author

N74-18338*# Boston Univ., Mass.
PHOTOELECTRON ANGULAR DISTRIBUTIONS AS A PROBE OF ANISOTROPIC ELECTRON-ION INTERACTIONS
Dan Dill, Steven T. Manson (Ga. State Univ., Atlanta), and Anthony F. Starace (Univ. of Nebr., Lincoln) [1974] 13 p refs Sponsored in part by AEC
(Grants NGR-28-004-021; NSF GP-38905)
(NASA-CR-177076; COO-1674-88) Avail: NTIS HC $4.00 CSCL 20H

Expressions are given for atomic photoelectron angular distributions in LS coupling in which the role of anisotropic final state electron-ion interactions emerges explicitly. Calculations of photoelectron angular distributions for atomic sulfur are presented in which these anisotropic interactions produce pronounced deviations from the predictions of the Cooper-Zare model. Such effects are expected to be a general feature of photoelectron angular distributions for most open shell atoms. Author

N74-18339*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARGED PARTICLE MOTIONS IN A MAGNETIC FIELD WHICH REDUCE TO MOTIONS IN A POTENTIAL
David P. Stern Mar. 1974 21 p refs Submitted for publication
(NASA-TM-X-70604; X-602-74-64) Avail: NTIS HC $4.25

If the Hamiltonian for the motion of a charged particle in a magnetic field has one or more cyclic coordinates it may often be viewed as representing the motion of a particle subject to a potential V. The use of V provides qualitative insight about the motion even in some cases where a solution of the motion cannot be obtained. Several examples using this concept are reviewed and discussed. Author

N74-18340# Laboratoire de Physique Theorique et Particules Elementaires, Orsay (France).
CLUSTER ORIENTED APPROACH TO MULTIPARTICLE PRODUCTION
A. Krzywicki 1973 26 p Presented at the Colloq. sur la Phys. Hadronique aux Energies des ISR, Marseille, Nov. 1973 (LPTHE-73/33) Avail: NTIS HC $4.50

Attention is focused on the characteristic features of the structure of individual events for multiparticle production. Three examples are given. A candidate for an important law which specifically applies to the structure of the individual events (the local compensation of charges in rapidity space). A simple hypothesis about the structure of individual events can lead to a dynamical model (the bootstrap model of inclusive spectra). A recent cluster-oriented ISE experiment by the Pisa-Stony Brook team is discussed. Author

N74-18341# Atomic Energy Commission, Washington, D.C. Div. of Physical Research.
GOALS AND ACHIEVEMENTS IN HIGH ENERGY PHYSICS
Jun. 1973 24 p
(WASH-1263) Avail: SOD HC $0.35

The summary of high energy physics includes atomic, nuclear, and subnuclear matter, deep inelastic electron-proton scattering, electron-position colliding beams, proton-proton collisions, universal behavior at high energies, heavy ion research, beam fragmentation, neutrinos, unified theories of weak and electromagnetic interactions, and high energy physics and astronomy. NSA

N74-18342# Commissariat a l'Energie Atomique, Montrouge (France). Centre d'Etudes de Bruyeres-le-Chatel.
CONFIRMATION OF THE EXISTENCE OF A LIQUID ZONE CREATED BY ELECTRON BOMBARDMENT Ph.D. Thesis - Lyon Univ.
Michel Deleuze Sep. 1973 111 p refs In FRENCH
(CEA-R-4476) Avail: AEC Depository Libraries HC $7.75

The existence of a liquid zone in metallic samples melted by electron bombardment was investigated. A process was developed which is based on the discontinuity of the wave velocity at the solid-liquid phase change. This method was studied in detail and experimentally verified. The centrifugation method, which is very easily set up, provides excellent results for the contours of the molten zone. This method consists of removing the liquid metal from the sample so that the resulting cavity reveals the interface. The effects of the nature of the metal, the displacement of the sample, and the power of the bombarding electron beam on the form of the liquid zone are presented as examples for the case of certain pure metals. Author (NSA)

N74-18343# Danish Atomic Energy Commission, Risoe.
ELECTRON HEATING IN A SINGLE-ENDED Q-MACHINE
H. L. Pecseli and P. I. Petersen May 1973 16 p refs
(RISO-290) Avail: AEC Depository Libraries HC $3.00

Electron heating in a single-ended Q-machine was tried out by two different techniques: by application of micron-wave power at the electron cyclotron frequency, and by insertion of a positively biased grid close to the hot plate. The electron temperature was measured with a Langmuir probe. By means of the first method, the electron temperature was increased by a factor of 2 without any significant disturbance of the ion distribution function. By the other method, the electron temperature was increased by a factor of 4. This heating was accompanied by a severe distortion of the ion distribution function which could be remedied by charge exchange cooling of the ions. Author (NSA)

N74-18344# Paris Univ., Orsay (France). Lab. de l'Accelerateur Lineaire.
PHI MESON CONTRIBUTION TO THE VACUUM POLARIZATION PROVED BY STUDY OF THE REACTION ELECTRON POSITRON YIELDS POSITIVE MUON NEGATIVE MUON Ph.D. Thesis [MISE EN EVIDENCE DE LA CONTRIBUTION DU MESON PHI A LA POLARISATION DU VIDE PAR L'ETUDE DE LA REACTION ELECTRON POSITRON PRODUIT MUON POSITIF MUON NEGATIF]
Frederique Fulda Apr. 1973 195 p refs In FRENCH
(LAL-1266) Avail: NTIS

The absolute value of the electron positron yield positive muon negative muon reaction cross section is used to determine, with 97.3% accuracy, the existence of hadronic contribution to vacuum polarization. The double bremsstrahlung reaction was used to normalize the experimental reaction cross section. The theory of the reaction is presented with regard to QED and polarization of input particles, radiative corrections, perturbation method approach of virtual transitions effects and Kallen-Lehmann representation of the photon propagator. The positive kaon disintegration through measurement of the resulting positive muon was used to trace the excitation curve of the phi meson and calibrate the beam energies in a 12 MeV bandwidth at 510 MeV energy. The results are discussed with regard to ACO beams polarization, shown to be nonexistent, and the cut off parameter for QED tests reduced from this experiment to 2.7 GeV/C. The branching ratio for the leptonic disintegration of the phi-meson is shown to be at 2.69 standard deviations from the null value. ESRO

N74-18345# Westfield Coll., London (England). Dept. of Physics.
CORRELATIONS BETWEEN THE LEADING PROTON AND PIONS IN HIGH ENERGY PROTON-PROTON COLLISIONS
J. Kasman Oct. 1973 15 p refs
Avail: NTIS HC $4.00

The study of inclusive rapidity spectra pp yields pX and pp proton proton yields proton pion X at high energies provides a test of the assumptions of the diffractive excitation model. The magnitude and shape of correlations between the leading proton and produced pions favours a modified model, in which the diffractive cluster decays longitudinally, rather than isotropically. Author (ESRO)

N74-18346# Westfield Coll., London (England). Dept. of Physics.
TWO-PION CORRELATIONS IN THE DIFFRACTIVE EXCITATION MODEL
James Kasman Oct. 1973 29 p refs
Avail: NTIS HC $4.50

The diffractive excitation model is formulated in terms of rapidity, and used to calculate the inclusive rapidity distributions. Using simplified kinematics, analytic calculations are made for these distributions and the related multiplicity moments. The two-pion correlations are found to be in agreement with experiment at low energies, but rise too rapidly with energy, lying an order of magnitude above ISR data. A modified DEM, with longitudinal decay of the diffractive cluster, accounts for the size of correlations at the ISR. Author (ESRO)

N74-18347# Westfield Coll., London (England). Dept. of Physics.
ELASTIC AND INCLUSIVE CROSS-SECTIONS AT LARGE TRANSVERSE MOMENTA
Michael Teper Oct. 1973 25 p refs Sponsored by UK Sci. Res. Council
Avail: NTIS HC $4.50

The relationship between elastic and inclusive cross sections at large transverse momenta is discussed from the view point of s channel unitarity. A multiperipheral model is developed which correlates some recently proposed forms for these cross sections. Author (ESRO)

N74-18348# Mainz Univ. (West Germany). Inst. fuer Anorganische Chemie und Kernchemie.
ANALYSIS OF SHORT-LIVED RADIONUCLIDES FROM CHINESE NUCLEAR TEST FALLOUT [ANALYSE KURZLEBIGER RADIONUKLIDE AUS FALLOUT VON CHINESISCHEN KERNWAFFENTESTS]
J. Fahland and R. Weinreich Bonn Bundeswehramt 1973 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(MBVg-FBWT-73-29) Avail: NTIS HC $6.25; Bundeswehramt 30 DM

Short lived radioactive fallout products were assayed after nuclear tests of the People's Republic of China by analysis of samples collected from airjets. The yields of some characteristic radionuclides were determined by chemical separation and absolute counting of beta(-) and gamma radiation. The measured yields were compared with the data obtained theoretically using equations of radioactive growth and decay and varying various characteristics parameters. From the degree of agreement between measured and calculated yield data it is possible to conclude about the following characteristics of the Chinese nuclear tests: the fissile material used, the most probable nuetron energy, the time integrated fluxes of moderated Maxwellian neutrons as well as of non moderated 14 MeV neutrons, and the contribution of Uranium-235 (or Plutonium-239) to the fission reaction. Author (ESRO)

N74-18349# California Univ., San Diego. Dept. of Chemistry.
TIME EVOLUTION OF UNIMOLECULAR PROCESSES IN ISOLATED MOLECULES BY CROSSED LASER AND MOLECULAR BEAMS
Stephen J. Riley, Robert K. Sander, and Kent R. Wilson 24 Nov. 1973 18 p refs
(Contract N00014-69-A-0200-6020)
(AD-771319) Avail: NTIS CSCL 07/4

The authors have developed a new technique, double absorption photofragment spectroscopy, in which a molecular beam is crossed with an initiation laser pulse followed, after a delay time, by a probe laser pulse and observe the recoiling photodissociation fragments with a mass spectrometer. This technique should allow the observation of the time development of unimolecular processes in isolated molecules over a time span from picoseconds to milliseconds. A first demonstration has been performed, the observation of the time evolution of predissociation in I2B state molecules as a function of their vibrational and rotational state distribution. GRA

N74-18350# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MANIFESTATION OF THE STRUCTURE IN ELECTRON ENERGY DISTRIBUTION FUNCTIONS AND USING IT TO DETERMINE THE EFFECTIVE CROSS SECTIONS OF INELASTIC PROCESSES
A. N. Soldatov and N. A. Prilezhaeva 28 Nov. 1973 21 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Fiz. (Tomsk), no. 11, 1971 p 51-62
(AD-771659; FTD-HT-23-919-74) Avail: NTIS CSCL 07/4

The paper concerns the features of the electron energy distribution function in a discharge with two coaxial tube electrodes; the inner electrode is in the form of a grid. The structure of the distribution functions is used to determine the effective cross sections of inelastic collisions. The reasons for manifestation of the structure of the electron energy distribution functions are discussed. GRA

N74-18579 Joint Publications Research Service, Arlington, Va.
CHARGE TRANSFER AND ITS INFLUENCE ON THE PROPERTIES OF MOLECULES OF ORGANIC COMPOUNDS
Z. V. Todres *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 111-115 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 81-84 Conf. held at Riga, 19-21 Mar. 1973 (For availability see N74-18567 09-34)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-18351# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF PLASMA THEORY
M. A. Leontovich, ed. 25 Feb. 1974 53 p refs Transl. into ENGLISH from Vopr. Teorii Plazmy (Moscow), no. 7, 1973 p 205-245, 271-273
(JPRS-61306) Avail: NTIS HC $5.75

The neoclassical theory of diffusion and kinetic theory of plasma equilibrium in axisymmetric systems are discussed. Transport factors of a rarefied plasma and plasma equilibrium are also considered. Author

N74-18352# Joint Publications Research Service, Arlington, Va.
STUDY OF THE POPULATION OF ROTATIONAL LEVELS OF NITROGEN MOLECULES EXCITED BY ELECTRON IMPACT IN FLOWS OF RAREFIED GAS WITH LARGE PARAMETER GRADIENTS
Z. T. Orlova 22 Feb. 1974 7 p refs Transl. into ENGLISH from Teplofiz. Vysokikh Temperatur, Akad. Nauk SSSR (Moscow), v. 11, no. 6, 1973 p 1137-1141
(JPRS-61292) Avail: NTIS HC $4.00

The results of measurement of the rotational temperature in flows of rarefied gas, characterized by large parameter gradients along the flow, are presented. Author

N74-18353# Sandia Labs., Albuquerque, N.Mex. Plasma Theory Div.
INTERPRETING SELF GENERATED MAGNETIC FIELD MEASUREMENTS IN LASER PRODUCED PLASMAS
M. M. Widner Aug. 1973 22 p refs
(Contract AT(29-1)-789)
(SLA-73-500) Avail: NTIS HC $3.25

Spontaneous magnetic field measurements from a number of reported experiments are compared with numerical simulation calculations using an electron pressure-driven magnetic source. Magnetic-field regeneration and strong dissipation can explain many qualitative features of field amplitude and direction measurements. Author (NSA)

N74-18354# Gulf General Atomic, San Diego, Calif.
CLASSICAL DIFFUSION DUE TO THERMAL EQUILIBRIUM FLUCTUATIONS IN THE dc OCTOPOLE
T. Tamano, R. Prater, and T. Ohkawa 29 Jan. 1973 11 p refs Presented at the 3d Intern. Symp. on Toroidal Plasma Confinement, Garching, West Germany, 26 Mar. 1973
(Contract AT(04-3)-167)
(GULF-GA-A-12512; Conf-730315-15) Avail: NTIS HC $3.00

Measurements of the magnitude and of the dependences of this diffusion coefficient on plasma parameters are presented. This diffusion can exceed classical diffusion due to binary electron-ion collisions when the plasma dielectric constant is small. This regime is investigated in the dc octopole. Author (NSA)

N74-18355# Paris Univ., Orsay (France).
RELATIONS BETWEEN THE EVOLUTION OF THE BEAM-PLASMA INSTABILITY AND THAT OF A LOW FREQUENCY INSTABILITY IN A COLD CATHODE REFLEX DISCHARGE Ph.D. Thesis
J. Lasalle 1972 63 p refs In FRENCH
(FRNC-TH-398) Avail: AEC Depository Libraries HC $5.25

It is shown that a low frequency relaxation oscillation in a plasma always accompanies a microwave phenomenon, which decomposes into a frequency vibration and a power relaxation of a HF line predicted by studying the beam-plasma instability. A sampling method was used to determine the time dependence of the principal parameters of the discharge, during a period of relaxation. The electron temperature variation with time gives that of the power emitted by the instability. The electron density variation with time gives the behavior of the computerized dispersion curves for the beam-plasma instability. An investigation of the electron radial diffusion enabled the determination of the influence of the HF heating on the electron density and then the evolution of the HF instability. NSA

N74-18356# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
CORRELATION FUNCTIONS OF NONISOTHERMAL WEAKLY TURBULENT PLASMA
Kh. O. Abdulloev and V. G. Makhankov 1973 26 p refs In RUSSIAN
(JINR-P9-7239) Avail: AEC Depository Libraries HC $3.50

An equation is obtained and studied for the correlation functions of nonisothermal isotropic plasma. It is shown that in the region of small wave numbers the width of the Langmuir wave correlation functions is determined by a 4-plasmon + interaction, while at large K, by the 1 yields 1 primets decay process. Author (NSA)

N74-18357# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
PLASMA HEATING BY ELECTROMAGNETIC (LASER) RADIATION
B. S. Getmanov and V. G. Makhankov 1973 9 p refs In RUSSIAN
(JINR-P4-6952) Avail: AEC Depository Libraries HC $3.00

The problem is discussed for electromagnetic radiation scattering resulting from t yields t prime + s decay at homogeneous plasma heating (t is electromagnetic, s is ion-acoustic waves). Because of strong anisotropy of s oscillations, induced by instabilities, the rate of scattering of t waves by these oscillations decreases considerably. Author (NSA)

N74-18358# Los Alamos Scientific Lab., N.Mex.
EXPERIMENTS WITH LASER PRODUCED PLASMAS: ELECTRONS, IONS, AND NEUTRONS
R. P. Godwin 1973 22 p refs Presented at 3d Workshop on Laser Radiation and Related Plasma Phenomena; Troy, N. Y., 13-17 Aug. 1973
(Contract W-7405-eng-36)
(LA-UR-73-1394; Conf-730836-3) Avail: NTIS HC $3.25

Experimental results, particularly X-ray bremsstrahlung and ion time-of-flight measurements, obtained from plasmas generated with a 10 J, 25 psec Nd:YAG-Nd: glass (1.06 micrometer) laser delivering focal spot intensities of greater than 10 to the 16th power W/sq cm are reviewed. Preliminary experiments with a 10 J, 1 Nsec CO2 (10.6 micrometer) laser delivering approximately 10 to the 14th power W/sq cm to a target are briefly discussed. Both sets of experiments yield high energy (tens of keV) electrons and ions. Experimental evidence indicates that neutron emission

can be explained by electron heating and a consequent ion acceleration. Therefore, neutron production in laser produced plasmas can be a delusive diagnostic. Author (NSA)

N74-18359# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.

PLASMA EXPERIMENT PROPOSAL: MOTHER/DAUGHTER PROJECT

A. Egidi Sep. 1972 40 p refs

(LPS-72-23) Avail: NTIS HC $5.00

An experiment aimed at performing measurements of the flux of positive ions and electrons as a function of direction of flow and energy (in the range 50 eV/q to 25 keV/q and 35 eV to 7keV respectively) is proposed. The experiment uses an electrostatic analyzer as an energy selector with Faraday cups and Channeltrons as particle flux detectors. The presence of several detectors allows the simultaneous measurement of flux in different energy windows. A particular routine for the scanning of the energy range was studied in order to give significant information on the particle spectrum, in a time shorter than the duration of the complete scanning routine. A preliminary analysis of the measurements will derive for the different components of the solar wind (protons, electrons, alpha particles, and possibly heavier ions) the principal parameters such as vectorial bulk velocity, density, temperature, and anisotropy as functions of space and time. Author (ESRO)

N74-18360# Innsbruck Univ. (Austria). Div. of Space Plasma Physics.

GROWTH RATES OF THE ION CYCLOTRON INSTABILITY IN THE EARTH'S MAGNETOSPHERE

E. Maerk, ed. 1 Sep. 1973 11 p refs Submitted for publication

(UNICP-AR1) Avail: NTIS HC $4.00

The effect of injecting cold plasmas with different ion masses on the growth rates of the magnetospheric ion cyclotron instability is discussed. Growth rate was calculated in the zero-, first-, and second-order approximation using equations developed from literature for a magnetoplasma consisting of hot protons, hot electrons, cold ions, and cold electrons. The convective wave loss rate, which is proportional to the group velocity, was also calculated. ESRO

N74-18361# Innsbruck Univ. (Austria). Div. of Space Plasma Physics.

A MODEL OF THE MAGNETOPAUSE WITH ANISOTROPIC PARTICLE INCIDENCE

Ferdinand F. Cap, ed. and Manfred P. Leubner 15 Sep. 1973 7 p refs

(UNICP-AR2) Avail: NTIS HC $4.00

The change of shape of the magnetospheric boundary, especially near the neutral points, due to the introduction of a distribution function for the direction of the incident particles, was examined. A model was developed and the plasma pressure in regions of the magnetopause, when the tangential plane is perpendicular to the solar wind stream velocity, is shown to decrease in comparison to the Beard model. The results imply a more pronounced curvature of the magnetospheric boundary near the neutral points. ESRO

N74-18362# Paris Univ., Orsay (France). Lab. de Physique des Plasmas.

IONIZATION WAVE INSTABILITY IN ONE HF RESONANCE EXCITED PLASMA [INSTABILITE D'UNE ONDE D'IONISATION DANS UN PLASMA EXCITE SUR UNE DE SES RESONANCES H.F.]

Annie Peyre-Constantin May 1973 92 p refs In FRENCH

(LP-137) Avail: NTIS HC $7.75

The role of ionization waves in a collisional plasma is described. The basic mechanisms stratification, stationary striations at zero phase velocity and in HF plasmas, and amplification conditions are reviewed. The plasma, at equilibrium and under perturbation, is characterized with regard to electronic temperature and energy balance. The experimental set up and associated diagnostics are detailed, and evidence for the existence of ionization waves induced by a resonant HF wave is presented with emphasis on the Tonks Dattner instability and the main dipolar mode. Calculation of the dispersion relations and instability conditions are carried out and the physical mechanisms responsible for the reported instability are discussed in comparison with other mechanisms responsible for BF instabilities. ESRO

N74-18363# Paris Univ., Orsay (France). Lab. de Physique des Plasmas.

NONLINEAR WAVE PROPAGATION IN PLASMAS [PROPAGATION NON LINEAIRE DES ONDES DANS LES PLASMAS]

J. L. Delcroix, J. Bretagne, P. Leprince, T. D. Mantei, and G. Mathieussent Sep. 1972 51 p refs In FRENCH; ENGLISH summary

(LP-141) Avail: NTIS HC $5.75

Wave propagation in plasmas is well understood in the linear approximation, both from the theoretical and experimental point of view, but the non-linear processes affecting wave propagation are less well known. Recent progress in this field is outlined including a comparison of experimental results with theoretical predictions of wave-wave coupling and decay, particle trapping by a large-amplitude wave, and the formation of solitons and shock waves. Author (ESRO)

N74-18364# Paris Univ., Orsay (France). Lab. de Physique des Plasmas.

ATOMIC AND MOLECULAR METASTABLE STATES IN ELECTRIC DISCHARGES [METASTABLES ATOMIQUES ET MOLECULAIRES DANS LES DECHARGES ELECTRIQUES]

J. L. Delcroix, C. Matos Ferreira, and A. Ricard Oct. 1973 197 p refs In FRENCH

(LP-142) Avail: NTIS HC $13.00

Physical processes and experimental techniques on metastable states in electric discharges are reviewed. General atomic and molecular metastable state properties are described, and various ionic, vibrational and electronic states are detailed. Optical measurement methods are reported with emphasis on optical absorption and laser interferometry as applied mainly to nitrogen metastables. Photoionization methods for vibrational molecular states are also delt with. The creation and destruction of metastables by electronic collision, heavy particle collisions, and wall diffusion losses are detailed with regard to the A2, N2. The metastable balance equation treatment is emphasized and the production of metastables in afterglows or hollow cathode arc discharges is discussed. Experimental results obtained in the two above mentioned production regimes are reviewed in the case of argon. Finally, transfer mechanisms metastables to molecules by chemi-ionization (Penning effect and associative ionization) or by chemi-excitation are delt with. ESRO

N74-18365# Paris Univ., Orsay (France). Lab. de Physique des Plasmas.

PRESENTATION OF THE GAPHYOR SYSTEM [PRESENTATION DU SYSTEME GRAPHYOR]

J. L. Delcroix Oct. 1973 29 p refs In FRENCH Sponsored by the Direc. de Rech. et Moyens d'Essais

(LP-145) Avail: NTIS HC $4.50

The GAPHYOR computerized data base for literature on plasma physics is presented. The domain is limited to terrestrial pressures and temperatures for systems containing, at most, two chemical elements. Only low weight molecules or ions are considered containing a maximum eight atoms. Energies are limited in the upper range to 10 KeV. The indexing procedure and abstracting rules are given. A method of binary system classification loosely related to the Mendelejeff classification is presented. The chemical reaction codification is formulated. ESRO

N74-18366# Paris Univ., Orsay (France). Lab. de Physique des Plasmas.

NEW ION ACOUSTIC INSTABILITY

P. Leprince and J. Peyraud (Obs. de Nice) Sep. 1973 28 p refs

(LP-144) Avail: NTIS HC $4.50

In the presence of a quasi-resonant high frequency field, a new type of ion acoustic instability is described. In using the macroscopic equations, it is possible to show that an ion acoustic wave can be unstable when the high frequency is close to the resonance frequency. The experiment is performed on an afterglow

discharge; the secondary (or Dattner) resonance is excited. When the incident power increases, the reflected microwave is modulated by a low frequency, corresponding to the frequency of the ion acoustic oscillation. Author (ESRO)

N74-18367# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
STRUCTURE OF THE BOUNDARY LAYER BETWEEN A FIELD-FREE PLASMA AND A MAGNETIC FIELD IN VACUUM [STRUKTUR DER GRENZSCHICHT ZWISCHEN EINEM FELDFREIEN PLASMA UND EINEM MAGNETFELD IM VAKUUM]
R. Gruber and E. S. Weibel Nov. 1973 24 p refs In GERMAN; ENGLISH summary Sponsored by Swiss Natl. Found.
(LRP-72/73) Avail: NTIS HC $4.25

Self consistent solution of Vlasov's equations describing a plane boundary layer without shear are given. The currents within the layer are due to free and trapped electrons. The ion current is neglected since M sub e q < M sub i. The free electrons and the ions are assumed maxwellian at infinity. For the trapped electrons a one parameter family of distribution functions is assumed. Field and density profiles are computed for E(x), B(x), N sub e(x), N sub i(x), and j(x) for different numbers of trapped electrons. Numerical solutions are obtained by applying the finite difference method to a variational formulation of the problem. Author (ESRO)

N74-18368# Massachusetts Inst. of Tech., Cambridge. Lab. for Plasma Physics.
THE INITIAL VALUE PROBLEM IN A CLASS OF NON-UNIFORM PLASMAS
Robert Joel Rahn Feb. 1973 88 p refs
(Grant AF-AFOSR-1697-69; AF Proj. 9752)
(AD-771577; LPP-5; AFOSR-73-2089TR) Avail: NTIS CSCL 20/9

The response of a plasma with a spatially non-uniform equilibrium state has usually been discussed in the framework of WKBJ approximations to the governing integral equations, or of multiple-slab models, or by computer studies. Using approximate integral equations derived from the fully non-uniform orbit-integral equation for self-consistent electrostatic fields, closed-form expressions for the plasma response under arbitrary initial conditions are derived by perturbation-iteration techniques. The method is applied to the time-asymptotic evaluation of the response in a non-uniform plasma supporting a negative-energy mode and to the effect of non-uniform perturbations on a Landau-dampted electron plasma wave. Author (GRA)

N74-18369# United Kingdom Atomic Energy Authority, Culham (England).
X-RAY AND NEUTRON PRODUCTION OPTIMIZATION IN THE DENSE PLASMA FOCUS Final Report, 1 Jun. 1971 - 31 Jul. 1972
Nicol J. Peacock Nov. 1973 64 p refs
(Contract F44620-71-C-0098; AF Proj. 6110DE)
(AD-771194; AFWL-TR-73-147) Avail: NTIS CSCL 20/9

Parameters of the plasma focus experimental assembly at Culham, England, a coaxial gun type first described by Mather, have been evaluated using advanced laser diagnostic techniques. The measurements have resulted in a more nearly complete appreciation of the formation, duration, and breakup of the dense pinch phase of the focus. (Modified author abstract) GRA

N74-18370# Innsbruck Univ. (Austria). Inst. for Theoretical Physics.
LITERATURE SURVEY ON PLASMA INSTABILITIES COVERING 1972 PUBLICATIONS, PART 1 Interim Report
Gerhard Auer, ed., Ferdinand F. Cap, Rudolf Deutsch, Franz Herrnegger, Siegbert Kuhn, Joachim Schmid, Padma Shukla, and Lothar Lerch 30 Jun. 1973 207 p
(Contract F44620-72-C-0016; AF Proj. 9752)
(AD-771486; UNICP-SR96; AFOSR-73-2087TR-Pt-1) Avail: NTIS CSCL 20/9

The first part of the literature survey on plasma instabilities covering the year 1972 is reported. This volume contains 150 abstracts and survey reports on single instabilities. GRA

N74-18371# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A NONLINEAR THEORY OF THE PARAMETRIC INSTABILITY OF WAVES IN A PLASMA
V. S. Lvov and A. M. Rubenchik 9 Nov. 1973 21 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (USSR), v. 64, no. 2, 1973 p 515-525
(AD-771674; FTD-HT-23-745-74) Avail: NTIS CSCL 20/9

The authors study the nonlinear stage of decay instability of an external high-frequency electric field E(t) = (E sub 0 cos (omega sub 0) into Langmuir waves (LW) and ion-sound waves (ISW) (omega sub 0) = (omega sub k) + (omega sub (-k)), occurring in the linear stage of instability, also determines the nonlinear behavior of the wave system. GRA

N74-18372# Naval Research Lab., Washington, D.C.
THEORY OF MICROWAVE EMISSION BY VELOCITY-SPACE INSTABILITIES OF AN INTENSE RELATIVISTIC ELECTRON BEAM
Edward Ott and Wallace M. Manheimer Dec. 1973 24 p refs
(AD-771718; NRL-MR-2687) Avail: NTIS CSCL 20/9

The stability of waveguide modes in a waveguide along which is propagated an unneutralized, intense beam of relativistic electrons guided by an applied axial magnetic field is considered. It is found that the waveguide mode can interact unstably with the beam by resonating with the Doppler shifted cyclotron frequency of the beam. This instability appears to be the mechanism by which microwaves are produced in some recent experiments which are discussed. Author (GRA)

N74-18373# Naval Research Lab., Washington, D.C.
A SELF CONSISTENT THEORY OF THE FORMATION OF NON-THERMAL ION TAILS IN THE ION ACOUSTIC INSTABILITY Interim Report
Wallace M. Manheimer and Robert W. Flynn Sep. 1973 36 p refs
(AD-772090; NRL-MR-2664) Avail: NTIS CSCL 20/9

The rate at which ions are transported from the body to the non-thermal tail of the distribution function during the nonlinear stage of the ion acoustic instability is calculated self-consistently. The nonlinear stage is characterized by a very small growth rate and a tail whose population increases slowly in time. The calculation is done by conserving the energy and momentum of ions, electrons and electrostatic fields in the linear and non-linear regime. These two conservation laws give rise to two equations for growth rate and phase velocity. Author (GRA)

N74-18578 Joint Publications Research Service, Arlington, Va.
LOW-TEMPERATURE PLASMA AND ITS APPLICATION
N. N. Rykalin and V. V. Kudinov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 107-110 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 79-81 Conf. held at Moscow, 29-30 Mar. 1973 (For availability see N74-18567 09-34)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-18374*# Techtran Corp., Glen Burnie, Md.
INJECTION CURRENTS IN SEMICONDUCTORS WITH DEEP POLARIZABLE IMPURITY CENTERS
M. S. Isamukhamedova, P. M. Karageorgiy-alkalayev, and A. Yu. Leyderman Washington NASA Mar. 1974 7 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Vz. SSR (Tashkent), v. 30, no. 3, 1973 p 28-30
(Contract NASw-2485)
(NASA-TT-F-15298) Avail: NTIS HC $4.00 CSCL 20L

The injection of charge carriers in a semiconductor affords the possibility of modulating epsilon with current I by changing the saturation of local centers. The function epsilon (I) may influence the passage of space-charge limited currents. The

distribution of the field and potential in a semiconductor is determined and the volt-ampere characteristic of the specimen is described analytically. Author

N74-18375*# National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: MICROELECTRONIC ULTRASONIC BONDING
George G. Harman, ed. Jan. 1974 116 p refs Sponsored in part by NASA, DNA and Navy Strategic Systems Proj. Office (NASA-CR-137151; NBS-SP-400-2) Avail: NTIS MF $1.45; SOD HC $1.25 as C13.10:400-2 CSCL 20L

Information for making high quality ultrasonic wire bonds is presented as well as data to provide a basic understanding of the ultrasonic systems used. The work emphasizes problems and methods of solving them. The required measurement equipment is first introduced. This is followed by procedures and techniques used in setting up a bonding machine, and then various machine- or operator-induced reliability problems are discussed. The characterization of the ultrasonic system and its problems are followed by in-process bonding studies and work on the ultrasonic bonding (welding) mechanism. The report concludes with a discussion of various effects of bond geometry and wire metallurgical characteristics. Where appropriate, the latest, most accurate value of a particular measurement has been substituted for an earlier reported one. Author

N74-18376# United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics Div.
INVESTIGATION INTO CHANGES IN THE ELECTRICAL PROPERTIES OF THIN ANODIC OXIDE FILMS INDUCED BY ION IMPLANATION
N. W. Suffield Jul. 1973 31 p refs
(AERE-R-7395) Avail: AEC Depository Libraries HC $3.75

A study was made of the changes that could be induced in the electrical properties of a titanium/titanium dioxide/gold wafer by implanting the metal on which the oxide was to be grown with various ions. As it is difficult to obtain negative resistance cycling with Ti/TiO2/Au devices, Al/Al2O3/Au devices which readily exhibit these electrical phenomena were also studied for comparison purposes. Oxide layers were grown anodically. The effect of an implanation was studied in terms of differences in the voltage/current characteristic as compared with that of an un-implanted device. NSA

N74-18377# Stuttgart Univ. (West Germany).
DEFECT STRUCTURES IN SOLID BODIES Annual Report, 1 Apr. 1971 - 1 Apr. 1972 [SFB 67 DEFEKTSTRUKTUREN IN FESTEN STOFFEN]
1 Jul. 1972 102 p refs In GERMAN
Avail: NTIS HC $7.25

Results of research in the field of defect structures of solids are reported. Activity in the following projects is reported: crystal laboratory, low temperature supply, organic molecular crystal defects, defect structures in heteropolar crystals, semiconductor defects, and digital signal processing. ESRO

N74-18378# Stuttgart Univ. (West Germany).
DEFECT STRUCTURES IN SOLID BODIES Annual Report, 1 Apr. 1972 - 1 Apr. 1973 [SFB 67 DEFEKTSTRUKTUREN IN FESTEN STOFFEN]
1 Jul. 1973 156 p refs In GERMAN
Avail: NTIS HC $11.00

For abstract, see N74-18377.

N74-18379# Army Foreign Science and Technology Center, Charlottesville, Va.
ELECTRICAL AND PHOTOELECTRIC PROPERTIES OF HETEROJUNCTIONS BASED ON GERMANIUM AND CADMIUM AND ZINC SELENIDES
M. V. Kot and A. I. Sakhno 5 Dec. 1973 9 p refs Transl. into ENGLISH from the book "Poluprov. Soedin. i ikh Tverd. Rastvory" USSR, 1970 p 68-72
(AD-771406; FSTC-HT-23-2118-72) Avail: NTIS CSCL 20/12

Data were studied to predict the properties of heterojunctions. The effects of thickness of the materials on the electric and photoelectric properties, and the energetic system of the p-n heterojunctions for p Ge-nCdSe and p Ge-nZnSe are presented. Author

N74-18380# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
STUDIES ON THE TRANSFORMATIONS, THERMAL BEHAVIOR AND STRUCTURE OF AMORPHOUS MATERIALS: COVALENTLY BOUND AND METALLIC Final Report, 1 Sep. 1963 - 31 Aug. 1973
David Turnbull Aug. 1973 23 p refs
(Contract N00014-67-A-0298-0009; NR Proj. 032-485)
(AD-771359) Avail: NTIS CSCL 20/12

The researches supported by this contract are described in the 47 papers, most of which also appeared as ONR technical reports, listed in the bibliography. This report recapitulates in summary form some of the major outcomes of these researches under the major headings: (1) Theory for the Amorphous State; (2) Amorphous Covalently Bonded Systems: phase transformation behavior and structure; (3) Amorphous Metallic Systems: formation and structure and thermal, rheological and phase transformation behavior; (4) Fast Diffusion in Metallic Alloys. Author (GRA)

N74-18381# Tyco Labs., Inc., Waltham, Mass.
SEMICONDUCTOR NEUTRON DETECTORS Final Technical Report, 13 Mar. 1972 - 12 Jan. 1973
F. Wald and J. Bullitt Wright-Patterson AFB, Ohio AFFDL Jan. 1973 34 p refs
(Contract F33615-72-C-1756)
(AD-771526; C-219; AFFDL-TR-73-13) Avail: NTIS CSCL 18/4

The goal of this program was the crystal growth of red alpha-rhombohedral boron for use as a semiconductor neutron detector. Red boron was prepared as microscopic crystals by a variety of techniques. Crystals of red boron 0.1 mm long were prepared by the chemical vapor deposition (CVD) of BBr3 at 1170 C. Microscopic crystals of red boron could also be prepared by the vapor-liquid-solid and traveling solvent method variations of CVD as well as by precipitation from copper-gold solutions. Solid solutions of copper and gold in beta-rhombohedral boron have been grown by the traveling heater method from a copper-gold alloy at temperatures of 1000 to 1200 C. The electrical and optical properties of this material appear to be dominated by the same kind of trapping mechanism that controls the properties of high purity beta-boron. The only distinguishing feature of this material seems to be that both the trap concentration and the free carrier concentration are quite high. The free carrier mobilities of this material are low, which precludes its use for semiconductor radiation detection. Author (GRA)

N74-18382# Illinois Univ., Urbana. Materials Research Lab.
RESEARCH ON THE DYNAMIC STRUCTURE OF LIQUIDS, LIQUID CRYSTALS AND DISORDERED SOLIDS. RESEARCH ON SEMICONDUCTOR MATERIALS AND DEVICES Semiannual Technical Report, 1 Jun. - 30 Nov. 1973
Robert J. Maurer Dec. 1973 26 p refs
(Contract DAHC15-73-G-0010; ARPA Order 2259)
(AD-771322; UILU-ENG-73-3402) Avail: NTIS CSCL 20/12

The dynamic structure of liquids and disordered solids is investigated by Rayleigh, Brillouin and Raman light scattering, by nuclear magnetic resonance and by infrared absorption. Simple liquids, liquid crystals, polymers, glasses, organic semiconductor and hydrogen in metals are the objects of investigation. The properties of light emitting and laser diodes of the semiconductors GaAsP, InGaAs and InGaP are investigated to improve and extend their behavior. Impurities and imperfections in silicon which affect the properties of solid state devices are investigated for the purpose of controlling and improving device performance. Author (GRA)

N74-18383# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
LUMINESCENCE STUDIES OF POINT DEFECTS IN SELECTED OXIDES Final Report
Peter L. Land Aug. 1973 12 p refs
(AF Proj. 7021)
(AD-771002; ARL-73-0145) Avail: NTIS CSCL 20/12

The investigation is centered on the study of thermoluminescence, fluorescence and coloration of metal oxides resulting from included point defects. The major accomplishments are summarized and publications generated under this effort are referenced. Author (GRA)

N74-18384# Aerospace Corp., El Segundo, Calif. Lab. Operations.
THE SPACE GROUP OF BETA-GA203, ITS MORPHOLOGY, AND UNUSUAL TWINNING Report for 1962 - 1972
Gerard M. Wolten and Armond B. Chase 30 Nov. 1973 33 p refs
(Contract F04701-73-C-0074)
(AD-771481; TR-0074(9270-01)-2; SAMSO-TR-73-366) Avail: NTIS CSCL 20/2

Evidence is presented that the space group of beta-Ga2O3 is P1, although, metrically, the lattice is strictly monoclinic. The morphology is described and examples of twinning are given, including several that are unusual. Author (GRA)

N74-18385# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
ELECTRICAL, OPTICAL AND MECHANICAL BEHAVIOR OF PHOTOCONDUCTING II-VI COMPOUND SEMICONDUCTORS Final Report, 15 Sep. 1971 - 31 Oct. 1973
C. Norman Ahlquist 1 Nov. 1973 10 p refs
(Grant AF-AFOSR-2172-72; AF Proj. 9761)
(AD-771015; AFOSR-73-2088TR) Avail: NTIS CSCL 20/12

The interrelationship of the electrical, optical and mechanical properties of II-VI compounds has been studied experimentally. Observed increases in flow stress during illumination with white light are shown to be the result of the interaction of charged dislocations with charged point defects. The introduction of charged dislocations during plastic flow leads to an increase and decrease in electrical conductivity in n- and p-type CdTe, respectively. These conductivity changes are consistent with the creation of an excess of dislocation donor states during deformation. Light is shown to decrease the resistance to crack propagation in CdTe. This change in crack extension resistance results from a decrease in plastic work accompanying fracture. Author (GRA)

N74-18386# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PARAMAGNETIC EFFECT IN SUPERCONDUCTORS OF THE FIRST KIND
I. L. Landau 26 Nov. 1973 20 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 64, no. 2, 1973 p 557-567
(AD-771665; FTD-HT-23-750-74) Avail: NTIS CSCL 20/12

For the case of the destruction of superconductivity by a current in the presence of a longitudinal magnetic field the authors propose a structure consisting of coaxial layers of the two-dimensional mixed state moving toward the axis of the specimen. Results of experimental studies are given which are in good agreement with the proposed model. GRA

N74-18387# Texas Univ., Austin.
SUPERCONDUCTIVITY IN ONE- AND TWO-DIMENSIONAL SYSTEMS Final Report, Oct. 1971 - Sep. 1972
George E. Fredericks 1 Sep. 1973 28 p refs
(Contract DAAK02-72-C-0044; DA Proj. 1T0-61102-A-34A)
(AD-771911) Avail: NTIS CSCL 20/12

The report contains an account of an investigation of superconductivity with particular emphasis on systems which may be analyzed in terms of one and two dimensional models. In particular, the mixed crystal system Nb(x)Mo(1-x)S2 was studied, experimentally. In addition a simple theoretical model was developed to account for the increase in the superconducting transition temperature in layered compounds as the number of layers is increased. Author (GRA)

N74-18388# Army Foreign Science and Technology Center, Charlottesville, Va.
SYMPOSIUM ON CRYSTALLIZATION FROM SOLUTIONS AND MELTS
N. P. Luzhnaya and V. A. Koptsik 1 Nov. 1973 5 p Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1965 p 66-67
(AD-771702; FSTC-HT-23-335-73) Avail: NTIS CSCL 20/2

The report briefly discusses a symposium on crystallization from solutions and melts held in Berlin. The papers fell into six basic groups: general questions on theory and method, synthesis of corundum single crystals, crystallization of mica from solutions and melts, synthesis of garnets, synthesis of semiconducting single crystals, and synthesis of tungstate and titanate single crystals. GRA

N74-18389# Army Foreign Science and Technology Center, Charlottesville, Va.
CHANGE OF SHAPE OF A PORE MOVING IN A HETEROGENEOUS FIELD
M. A. Krivoglaz 16 Nov. 1973 14 p refs Transl. into ENGLISH from the publ. "Struktura i Svoistva Metallov" Kiev, Naukova Dumka, 1970 p 37-45
(AD-771731; FSTC-HT-23-2413-72) Avail: NTIS CSCL 20/12

The curvature of a porous surface is discussed which leads to the appearance of additional diffusion flows related to the curvature of the surface itself as well as the internal stresses. It is shown that the curvature of the surface of an inclusion, and the development of internal stresses continue until these flows, together with flows in the field of external forces, lead to an identical rate of movement for all sectors in the inclusion. After this a stable state arises in which the pore moves as a unit hole. It is concluded that the stable form of the distorted moving pore and the stationary field of internal stresses can be determined from the equality condition of velocities for all surface vectors. Author

N74-18390# Texas Instruments, Inc., Dallas. Central Research Labs.
LIQUID CRYSTAL DISPLAY PANEL Quarterly Technical Report, 1 Dec. 1972 - 28 Feb. 1973
A. R. Kmetz Nov. 1973 24 p
(Contract DAAB07-72-C-0158)
(AD-771063; TI-08-73-25; ECOM-0158-3-72; QTR-3) Avail: NTIS CSCL 09/5

The objective of this program is to demonstrate the feasibility of developing an effective x-y addressed liquid crystal display by fabricating a three-inch square flat dynamic scattering device incorporating all addressing and drive circuitry for the display of alphanumeric and vector-graphical information at a resolution of 30 lines per inch. The reflective display will be built directly on a silicon substrate containing an MOS random access memory with interface drivers. To eliminate chip-to-chip interconnections inside the display, the substrate will be a mosaic of four 1.7-inch square integrated circuit chips with exceptionally low circuit density. A partial redesign of the MOS circuit layout to facilitate photomask generation for these very large devices by reticle composition has been completed. A mechanical prototype display was built. (Modified author abstract) GRA

N74-18391# Army Foreign Science and Technology Center, Charlottesville, Va.
EFFECT OF FORMATION CONDITIONS ON THE ELECTRICAL PROPERTIES OF EPITAXIAL P-N JUNCTIONS IN GALLIUM ARSENIDE
U. M. Kulish et al 26 Nov. 1973 13 p refs Transl. into ENGLISH from Vop. Sb. Arsenid Galliya (USSR), no. 3, 1970 p 152-162
(AD-771735; FSTC-HT-23-1986-72) Avail: NTIS CSCL 09/1

Electrical properties were investigated of p-n junction in GaAs obtained by the method of liquid epitaxy. The electrical characteristics of p-n junctions obtained in a narrow temperature interval depend on the epitaxy temperature, which is explained by the corresponding dependences of the solidus curves of the corresponding quasibinary systems. The crystallographic orientation of the substrate significantly influences the electrical and optical properties of laser junctions. Acceptor impurities exert various effects on the electrical and optical properties of epitaxial laser semiconductor diodes. (Modified author abstract) GRA

N74-18392# IBM Watson Research Center, Yorktown Heights, N.Y.
MAGNETIC SEMICONDUCTORS: A STUDY OF OPTICAL

TRANSPORT AND TUNNELING PROPERTIES AND THEIR INTERDEPENDENCE Final Report, 15 Jun. 1970 - 14 Sep. 1973
F. Holtzberg, w. A. Thompson, J. B. Torrance, and S. VonMolnar 14 Nov. 1973 112 p refs
(Contract N00014-73-C-0075; NR Proj. 018-811)
(AD-772120) Avail: NTIS CSCL 20/12

The report summarizes research in magnetic semiconductors carried out by the authors. A list of publications and invited presentations is included, in addition to copies of the 20 publications written under this contract. Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-18393*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A SOLUTION TO THE PROBLEM OF OPTIMIZING THE FUEL BIAS FOR A LIQUID PROPELLANT ROCKET BY AN APPLICATION OF THE CENTRAL LIMIT THEOREM
William Jr. Viera Mar. 1974 24 p refs
(NASA-TM-X-64829) Avail: NTIS HC $4.25 CSCL 21I

A method of determining the fuel bias for a bipropellant liquid rocket that minimizes outage associated penalties on payload potential is presented. A fuel bias so derived is normally called the optimum fuel bias. The subjects discussed are: (1) probability density function of outage, (2) computer program listing, and (3) choosing the optimum fuel bias. Author

N74-18394# Defence Research Information Centre, Orpington (England).
QUALITATIVE DETERMINATION OF ORGANOMETALLIC SUBSTANCES IN SOLID PROPELLANTS BY THIN LAYER CHROMATOGRAPHY
K. H. Habermann May 1973 12 p refs Transl. into ENGLISH from Explosivstoffe (Mannheim), v. 19, no. 7/8, 1971 p 121-125
(DRIC-Trans-3189; BR30531) Avail: NTIS HC $4.00

A thin layer chromatography process was worked out which permits, within a relatively short space of time, the qualitative determination of organometallic salts forming part of solid fuels. Separation was achieved with a 3-component traveling solvent. Various spray reagents were found for making the substances visible. With their help it is possible to determine the substances which are not visible in UV light. The method was successfully double-checked and its practical applicability verified on solid fuels of previously unknown composition. Author (ESRO)

N74-18395# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
ENGINEERING PROPERTIES OF ROCKET PROPELLANTS Final Report, 19 Jan. 1971 - 16 Sep. 1973
R. C. Mitchell, R. W. Melvold, and J. Quaglino Nov. 1973 159 p refs
(Contract F04611-71-C-0035)
(AFRPL-TR-73-105; AD-771580; R-9357) Avail: NTIS CSCL 21/9

The results of a 32-month program on the analytical and experimental characteristics of the physical properties of selected propellants are presented in three phases. In Phase 1, a continual review of the literature was conducted to ensure the acquisition and documentation of current propellant properties data. Phase 2 experimental efforts resulted in measurements of selected liquid propellants. Phase 3 consists of evaluation and compilation of data. GRA

N74-18396# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
CARTON/MOTOR SAMPLE CORRELATION Final Technical Report
S. John Bennett Dec. 1973 179 p refs
(Contract F04611-71-C-0026)
(AD-771808; AFRPL-TR-73-83; Publ-73504) Avail: NTIS CSCL 21/9

A difference has been observed in the mechanical properties of propellant taken from a dissected motor after storage and carton samples which have been similarly stored. This discrepancy in data values has been attributed to an exotherm during cure which increases temperatures as much as 15F in the motor samples compared with carton samples. The objective of this program was to determine whether altering the carton sample cure temperature history can correspondingly alter the carton sample mechanical properties so as to permit a more accurate calculation of actual motor properties. The necessary equations, coefficients, and parameters have been established, and it is believed that the program objective was accomplished. The studies indicated that this improved correlation can be made for both Stage I and Stage III Minuteman motors. Author (GRA)

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-18397*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALOG COMPUTER IMPLEMENTATION OF FOUR INSTANTANEOUS DISTORTION INDICES
William G. Costakis Washington Mar. 1974 32 p refs
(NASA-TM-X-2993; E-7736) Avail: NTIS HC $3.25 CSCL 21E

Dynamic distortion data obtained from inlet engine compatibility test on a J85-GE-13 engine are used to establish the feasibility of using on-line generated indices as control signals. These data are analyzed over time increments of 1.3 seconds on an analog computer. The analog program of four instantaneous distortion indices and their results are presented. A modified approach in determining the extent of distortion is also presented. Author

N74-18398*# Rocketdyne, Canoga Park, Calif.
EXPERIMENTAL INVESTIGATION OF COMBUSTOR EFFECTS ON ROCKET THRUST CHAMBER PERFORMANCE Final Report
W. H. Nurick and W. S. Hines Sep. 1973 201 p refs
(Contract NASw-2106)
(NASA-CR-134187; R-9315) Avail: NTIS HC $13.25 CSCL 21I

The results are reported of a program to develop special instrumentation systems and engine hardware, conduct tests using LOX/GH2 propellants wherein radial mixtures ratio stratification was controlled, and subsequently compare the results of four selected tests with the predictions of the JANNAF performance-prediction computer programs. During the experiments, the overall propellant mixture ratio was varied from 4.4 to 6.6, while the mixture ratios in the core and outer zone were varied from 5.7 to 8.8 and from 3.7 to 7.2, respectively. A nominal 10 percent of the total fuel flow was used as boundary layer collant in a majority of the firings. Nominal chamber pressure was either 225 or 250 psia, with nozzle expansion ratios of either 25:1 or 4:1. Measurements of the axial chamber pressure and wall heat flux profiles, together with samples of the exhaust gas, were obtained. The corrected experimental specific impulse and characteristic exhaust velocity efficiencies were approximately 97.5 and 98.5 percent, respectively. Author

N74-18399*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
EXPERIMENTAL AND DATA ANALYSIS TECHNIQUES FOR DEDUCING COLLISION-INDUCED FORCES FROM PHOTOGRAPHIC HISTORIES OF ENGINE ROTOR FRAGMENT IMPACT/INTERACTION WITH A CONTAINMENT RING
Raffi P. Yeghiayan, John W. Leech, and Emmett A. Witmer Oct. 1973 100 p refs
(Grant NGR-22-009-339)

(NASA-CR-134548; ASRL-TR-154-5) Avail: NTIS HC $8.00 CSCL 21E

An analysis method termed TEJ-JET is described whereby measured transient elastic and inelastic deformations of an engine-rotor fragment-impacted structural ring are analyzed to deduce the transient external forces experienced by that ring as a result of fragment impact and interaction with the ring. Although the theoretical feasibility of the TEJ-JET concept was established, its practical feasibility when utilizing experimental measurements of limited precision and accuracy remains to be established. The experimental equipment and the techniques (high-speed motion photography) employed to measure the transient deformations of fragment-impacted rings are described. Sources of error and data uncertainties are identified. Techniques employed to reduce data reading uncertainties and to correct the data for optical-distortion effects are discussed. These procedures, including spatial smoothing of the deformed ring shape by Fourier series and timewise smoothing by Gram polynomials, are applied illustratively to recent measurements involving the impact of a single T58 turbine rotor blade against an aluminum containment ring. Plausible predictions of the fragment-ring impact/interaction forces are obtained by one branch of this TEJ-JET method; however, a second branch of this method, which provides an independent estimate of these forces, remains to be evaluated. Author

N74-18400*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FORECAST OF JET ENGINE EXHAUST EMISSIONS FOR FUTURE HIGH ALTITUDE COMMERCIAL AIRCRAFT

Jack Grobman and Robert D. Ingebo 1974 34 p refs Presented at 3rd Conf. on Climatic Impact Assessment Program, Cambridge, Mass., 26 Feb. - 1 Mar. 1974

(NASA-TM-X-71509; E-7822) Avail: NTIS HC $4.75 CSCL 21E

Projected minimum levels of engine exhaust emissions that may be practicably achievable for future commercial aircraft operating at high altitude cruise conditions are presented. The forecasts are based on: (1) current knowledge of emission characteristics of combustors and augmentors; (2) the current status of combustion research in emission reduction technology; (3) predictable trends in combustion systems and operating conditions as required for projected engine designs that are candidates for advanced subsonic or supersonic commercial aircraft. Results are presented for cruise conditions in terms of an emission index, g pollutant/kg fuel. Two sets of engine exhaust emission predictions are presented: the first, based on an independent NASA study and the second, based on the consensus of an ad hoc committee composed of industry, university, and government representatives. The consensus forecasts are in general agreement with the NASA forecasts. Author

N74-18401*# Alabama Univ., University. Bureau of Engineering Research.

DOUBLE TIME LAG COMBUSTION INSTABILITY MODEL FOR BIPROPELLANT ROCKET ENGINES Final Report

Chang Keng Liu Sep. 1973 45 p refs

(Contract NCA8-63)

(NASA-CR-120137; BER-158-80) Avail: NTIS HC $5.25 CSCL 20H

A bipropellant stability model is presented in which feed system inertance and capacitance are treated along with injection pressure drop and distinctly different propellant time lags. The model is essentially an extension of Crocco's and Cheng's monopropellant model to the bipropellant case assuming that the feed system inertance and capacitance along with the resistance are located at the injector. The neutral stability boundaries are computed in terms of these parameters to demonstrate the interaction among them. Author

N74-18402*# Scientific Translation Service, Santa Barbara, Calif.

NEW MATERIALS FOR AIRCRAFT TURBOMACHINERY

M. ElGammal Washington NASA Mar. 1974 22 p Transl. into ENGLISH from Entropie (Paris), no. 51, May-Jun. 1973 p 25-32

(Contract NASw-2483)

(NASA-TT-F-15372) Avail: NTIS HC $4.25 CSCL 21E

Research in materials for improving aircraft turbines is reported. The development of standard alloys of titanium, nickel, and niobium is discussed along with developments in composite materials. The fabrication and structure of eutectic alloys is also discussed. F.O.S.

N74-18403# Stevens Inst. of Tech., Hoboken, N.J.

THE HYDROGEN IC ENGINE: ITS ORIGINS AND FUTURE IN THE EMERGING ENERGY-TRANSPORTATION-ENVIRONMENT SYSTEM

Kurt H. Weil [1973] 9 p refs

(Rept-729212) Avail: NTIS HC $4.00

A historical review of the internal combustion engine is presented. The use of hydrogen based fuels instead of hydrocarbon fuels are discussed as a fuel source for controlling air pollution both in automobiles and in electric utilities. S.K.W.

N74-18404# Politecnico di Torino (Italy). Ist. di Macchine e Motori per Aeromobili.

AXISYMMETRIC ELECTROMAGNETIC FIELD INFLUENCE ON THE CHARACTERISTIC VELOCITY OF AN ARC JET [INFLUENZA DI UN CAMPO ELETTROMAGNETICO ASSIALSIMMETRICO SULLA VELOCITA CARATTERISTICA DI UN ARCOGETTO]

Mario Oggero and Dario Gennuso Nov. 1973 20 p refs In ITALIAN

(Publ-154) Avail: NTIS HC $4.00

Tests for determining the influence of an axisymmetric EM field on the characteristic velocity of an arc jet are presented. The experimental set up is briefly described. Tests were performed with rotation induced by the centrifugal and magnetic fields in the same sense. The fuels used were He and N2 and the results are discussed. It is found that by variation of the induction, current, and arc jet strength, the behavior is determined essentially by the shape of the cathodic and anodic blobs on the electrodes together with their movement under the combined effect of the aerodynamic and magnetic fields. In view of the different characteristics of He and N2 in respect to the dissociation heat and ionization, it is expected that the regime of the arc jet when used with H2 fuel will be similar to that with He. ESRO

N74-18405# Colt Industries, Inc., West Hartford, Conn. Chandler Evans Control Systems Div.

TURBINE ENGINE FUEL CONTROL RELIABILITY AND MAINTAINABILITY ANALYSIS Final Report, 30 Jun. 1972 - 31 Mar. 1973

Dennis G. Burnell, Terry B. Morrison, and Albert H. White Aug. 1973 161 p refs

(Contract DAAJ02-72-C-0110; DA Proj. 1F1-62205-A-119)

(AD-771030; R-673-9; USAAMRDL-TR-73-60) Avail: NTIS CSCL 21/5

The report was undertaken to establish cost-effective recommendations for improving the design life and maintainability of Army gas turbine engine fuel control systems. Army experience indicates that problems with the fuel control account for 10 to 13% of the engine malfunctions and that 30 to 50% of the fuel control removals are unjustified. Data collected during the study indicates that failure modes common to the majority of all present-day fuel controls account for about 25% of the control removals. These failure modes included susceptibility to air and fuel contamination, fuel seal leaks, wear of drive splines, and improper adjustments. (Modified author abstract) GRA

N74-18406# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.

NAS REPORT ON TECHNOLOGICAL FEASIBILITY OF 1975-1976 MOTOR VEHICLE EMISSION STANDARDS. AN EVALUATION OF ALTERNATIVE POWER SOURCES FOR LOW-EMISSION AUTOMOBILES, NATIONAL ACADEMY OF SCIENCES

Apr. 1973 161 p refs

(Contract EPA-68-01-0402)

(PB-224859/9GA) Avail: NTIS HC $4.75; HC also available from NTIS $26.00/set of 8 reports as PB-224866-SET CSCL 21E

The panel has evaluated several near and long term alternative power systems including diesel, gas turbine Rankine cycle and

Stirling engines. In addition electric vehicles and alternative fuels were studied. Various aspects of each engine-system was considered including emissions, fuel economy, noise, cost size and weight, produceability and driveability. The report also discusses the lead time necessary to begin limited and mass production of each system. GRA

N74-18407# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Motor Vehicle Emissions.

NAS REPORT ON TECHNOLOGICAL FEASIBILITY OF 1975-1976 MOTOR VEHICLE EMISSION STANDARDS. EVALUATION OF CATALYST AS AUTOMOTIVE EXHAUST TREATMENT DEVICES, NATIONAL ACADEMY OF SCIENCES

Mar. 1973 85 p refs

(Contract EPA-68-01-0402)

(PB-224860/7GA) Avail: NTIS HC $3.75 HC also available from NTIS $26.00/set of 8 reports as PB-224866-SET CSCL 13B

The report covers investigations into the availability of catalyst for oxidation and NOx reduction with sufficient activity and stability, the causes of aging, and the interaction of catalysts with hardware modifications. The report also examines the raw material availability, manufacturing and maintenance problems, and the toxicology of debris. The panel also discusses several remaining problem areas. GRA

N74-18408# TRW, Inc., Redondo Beach, Calif. Transportation and Environmental Operations.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME 1. EXECUTIVE SUMMARY Final Report

Jul. 1973 51 p refs Revised Sponsored by EPA Prepared in cooperation with Coord. Res. Council, Inc., N.Y.

(PB-225024/9GA; CRC-APRAC-CAPE-13-68-13) Avail: NTIS HC $3.50 CSCL 13B

This volume summarizes the general objectives, approach, and results of an overall five year program which examined the feasibility of using mandatory vehicle inspection and maintenance as a means for controlling automobile exhaust emission levels. An annotated bibliography of program reports is included. GRA

N74-18409# TRW, Inc., Redondo Beach, Calif. Transportation and Environmental Operations.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME 2. MANDATORY INSPECTION/MAINTENANCE SYSTEMS STUDY Final Report

Jul. 1973 52 p Revised Prepared in cooperation with Coord. Res. Council, Inc. N.Y. Sponsored by EPA

(PB-225025/6GA; CRC-APRAC-CAPE-13-68-14) Avail: NTIS HC $3.50 CSCL 13B

This report summarizes the final results obtained from a systems study of mandatory vehicle inspection and maintenance. The report focuses on two areas of general importance which were not examined in early analyses. The first area involves studying the impact on procedure effectiveness of the rate with which engine adjustments and exhaust emissions deteriorate with vehicle use while the second area is concerned with determining the cost effectiveness of alternate program strategies including mandatory maintenance only. The study was conducted using the Economic Effectiveness Model and the complete experimental data base. The report is composed of five sections which cover the evaluation of alternative programs, system sensitivity analysis and study conclusions. GRA

N74-18410# Avco Lycoming Div., Stratford, Conn.

ADVANCED TORQUE MEASUREMENT SYSTEMS TECHNIQUE FOR AIRCRAFT TURBOSHAFT ENGINES Final Report, 7 Mar. 1972 - 7 Feb. 1973

Frank E. Scoppe Jun. 1973 113 p refs

(Contract DAAJ02-72-C-0045; DA Proj. 1F1-62203-A-434)

(AD-771965; LYC-73-4; USAAMRDL-TR-73-37) Avail: NTIS CSCL 21/5

A torque measuring system based upon a transducer using the magnetostrictive effect of a ferromagnetic material has been evaluated. Required accuracy of the measurement system was plus or minus 1% of reading for a range from 30 to 100% of shaft torque. This accuracy was to be obtained on shafts with metal temperature to 500F and with a system environmental temperature from -35F to -165F. The evaluation was performed in three phases: analysis, design and fabrication, and test. (Modified author abstract) GRA

N74-18411# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE THRUST OF AIRCRAFT ENGINES

V. Shaskin 28 Nov. 1973 12 p Transl. into ENGLISH from Grazhdanskaya Aviatsiya (Moscow), no. 5, May 1973 p 18-19 (AD-771607; FTD-HT-23-535-74) Avail: NTIS CSCL 21/5

During flight in different climatic zones and from airfields which are found at different altitudes it is necessary to evaluate accurately the influence of the temperature of the surrounding air and atmospheric pressure on the magnitude of take-off thrust of the engine. This makes it possible to establish the optimum program of control of the power plant. GRA

N74-18412# Aerospace Corp., El Segundo, Calif. Urban Programs Div.

GAS TURBINE ENGINE PRODUCTION IMPLEMENTATION STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report, Jan. - Jul. 1973

D. E. Lapedes, L. Forrest, F. G. Ghahremani, M. Hinton, T. Iura, O. Hamberg, W. U Roessler, W. M. Smalley, and J. Meltzer Jul. 1973 11 p

(Contract EPA-68-01-0417)

(PB-225465/4GA; ATR-73(7323)-1-Vol-1; DOT-TSC-OST-73-26-Vol-1) Avail: NTIS HC $3.00 HC also available from NTIS $8.00/set of 2 reports as PB-225464-SET CSCL 21E

An assessment is given of available information pertaining to implementing mass production of gas turbine powered automobiles. The status of the technology and implementation schedule visibility reported herein is that existing at the time of data acquisition visits made to selected firms and agencies during the period February 28 through April 30, 1973. The results of this study are presented in two volumes. Volume 2 presents a review of important findings and conclusions in the highlights and summary sections. GRA

N74-18413# Aerospace Corp., El Segundo, Calif. Urban Programs Div.

GAS TURBINE ENGINE PRODUCTION IMPLEMENTATION STUDY. VOLUME 2: TECHNICAL DISCUSSION Final Report, Jan. - Jul. 1973

D. E. Lapedes, L. Forrest, F. G. Ghahremani, O. Hamberg, W. U. Roessler, W. M. Smalley, M. Hinton, T. Iura, and J. Meltzer Sep. 1973 260 p refs

(Contract EPA-68-01-0417)

(PB-225466/2GA; TTR-73(7323)-1-Vol-2; DOT-TSC-OST-73-26-Vol-2) Avail: NTIS HC $6.25 HC also available from NTIS $8.00/set of 2 reports as PB-225464-SET CSCL 21E

An assessment is presented of available information pertaining to implementing mass production of gas turbine powered automobiles. The results of this study are presented in two volumes. Volume 2, the Technical Discussion, provides a comprehensive discussion of each study topic and is of interest primarily to the technical specialist. GRA

N74-18414# AiResearch Mfg. Co., Phoenix, Ariz.

LOW NOx EMISSION COMBUSTOR DEVELOPMENT FOR AUTOMOBILE GAS TURBINE ENGINES Final Report, 11 May 1971 - 30 Nov. 1972

D. W. Dawson, K. A. Hanson, and R. C. Holder Feb. 1973 273 p refs

(Contract EPA-68-04-0014)

(PB-225133/8GA; AT-6097-R12; APTD-1374) Avail: NTIS HC $15.75 CSCL 21E

Thirty-five combustor configurations were tested to determine emission characteristics. Chemical kinetics of emissions formation are discussed. A design technique that achieved significant NOx reductions in a gas turbine combustor was demonstrated. This technique involved the application of recuperator (or regenerator) bypass air directly into the combustor primary zone. The vaporizer

combustor resulted in the most significant improvement by the use of bypass flow. The optimum low emissions engine would use an engine cycle and variable bypass flow that have been matched to provide the best balance between fuel economy and related emissions. Variable recuperator bypass is a simple and convenient alternative to variable combustor geometry. The required control system is simpler and has the potential of: lower cost; higher reliability; and better maintainability. GRA

N74-18415# Aerotherm Corp., Mountain View, Calif.
COOLDOWN AND MOTOR FIRING THERMOSTRUCTURAL ANALYSIS OF A 7.0 INCH DIAMETER PYROLYTIC GRAPHITE INSERT Final Report, Jan. 1971 - Feb. 1972
Duane L. Baker, Joe E. Davis, and William S. Bonnett Jul. 1973 151 p refs
(Contract F04611-71-C-0023; AF Proj. 3059)
(AD-771781; AEROTHERM-73-74; AFRPL-TR-73-72) Avail: NTIS CSCL 21/8

A detailed thermochemical and thermostructural analysis was performed on a seven inch diameter nozzle throat insert composed of a pyrolytic graphite coating on an AGSR substrate. The analysis considered an environment produced by a solid rocket propellant at a chamber pressure of 1000 psia for a duration of sixty seconds. The analysis showed the effect on the thermostructural predictions, including plasticity effects, of including grooves in the substrate, and of the sensitivity of the stresses on the backside constraint. In addition, the predictions were made for both the cooldown during the manufacturing process and for various times during the solid rocket motor firing. (Modified author abstract) GRA

N74-18416# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AIRCRAFT AIR INTAKE REGULATOR
V. V. Sarev, B. G. Turbin, M. Ya. Goldman, and Yu. S. Belkin 28 Nov. 1973 6 p Transl. into ENGLISH from Russian Patent no. 342815, 22 Jun. 1972 p 1-2
(AF Proj. G101)
(AD-772021; FTD-HT-23-815-74) Avail: NTIS CSCL 21/5

The report describes a Soviet invention of a device whereby the air intake of aircraft engines is automatically regulated. GRA

N74-18417# Systems Research Labs., Inc., Dayton, Ohio.
INVESTIGATION IN ENERGY TRANSFER AND ENERGY CONVERSION FOR ADVANCED POWER AND PROPULSION SYSTEMS Final Report, 16 Mar. 1970 - 16 Mar. 1973
C. Calvert and J. Watson Oct. 1973 120 p refs
(Contract F33615-70-C-1515; AF Proj. 7116)
(AD-771581; ARL-73-0122) Avail: NTIS CSCL 10/2

The report covers the work done in three areas of energy conversion and transfer involving fluid dynamic processes: electrofluiddynamic energy conversion, multicomponent flow research, and aerodynamic energy transfer research. The effort under item one was an exploration of direct energy conversion of fluid dynamic energy into electrical power using electrofluid-dynamic (EFD) processes. The objective here was to identify workable and practical processes and designs for superior, lightweight, reliable, electrical generators. Item two covers studies of methods by which heat energy from reactions of solid particles or droplets contained in a combustion or reaction chamber can be used to produce fluid dynamic energy. The principal objective of this work was to assess wall erosion, particle suspension, and related fluid dynamic processes and components germane to practical thrust augmentation ejectors. The objective was to identify appropriate design concepts applicable to future vertical or short-field take-off-and-landing aircraft. (Modified author abstract) GRA

N74-18418# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
DETONATION TUBE CONDITIONS FOR SIMULATING: RP-1/LOX AND VARIOUS AMINE/N2O4 ROCKET ENGINE PLUMES
J. Leng and M. W. Slack Nov. 1973 28 p refs
(Contract DAAH01-72-C-0728)
(AD-771067; RM-581) Avail: NTIS CSCL 21/8

The report documents the running conditions necessary to simulate RP-1/LOX and various Amine/N2O4 rocket engine plumes using the Grumman Detonation Tube Facility to reproduce the chemical and thermodynamic state properties of the rocket engine combustion chamber. Absolute measurements of shortwave infrared (SWIR) radiation from a variety of plumes are being obtained. The propellant combinations being investigated are UDMH/N2O4, A-50/N2O4, RP-1/LOX, and H2/O2. (Modified author abstract) GRA

N74-18419# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPERIMENTAL BASE FOR SCIENTIFIC STUDIES IN THE AREA OF TECHNICAL OPERATION OF MARINE POWER PLANTS
B. M. Levin 5 Dec. 1973 10 p Transl. into ENGLISH from Tr. Tsentr. Nauchn.-Issled. Inst. Morsk. Flota (Leningrad), no. 126, 1970 p 99-108
(AD-771427; FSTC-HT-23-1806-72) Avail: NTIS CSCL 13/10

The necessity of a shore-based laboratory for testing of marine power plants, fuels and oils is demonstrated, and a possible list of laboratories and equipment to be included is presented. Author (GRA)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-18420*# Wyoming Univ., Laramie. Dept. of Physics and Astronomy.
MAGNETOSPHERIC MODULATION EFFECTS ON SOLAR COSMIC RAYS FROM SIMULTANEOUS OGO 1 AND 3 ION CHAMBER DATA IN 1968 AND 1969
D. J. Hofmann Oct. 1973 158 p refs
(Grant NGR-51-001-033)
(NASA-CR-137075) Avail: NTIS HC $11.00 CSCL 03B

Simultaneous observations by identical ionization chambers aboard the satellites OGO-1 and OGO-3 are utilized to investigate spatial variations in particle intensity near and inside the magnetosphere during the solar cosmic ray events of September 1966. Cross-correlation of the absolute proton flux computed from the chamber rate during three solar particle events shows good agreement with the measurements by the IMP-F Solar Proton Monitor during the same events. The chamber has a dynamic range of over six orders of magnitude. Before launch it was calibrated in the laboratory with radiation dosages in the range 1 R/hr-6000 R/hr. The OGO-1 and OGO-3 chambers, which were normalized in the laboratory prior to the launch, are found to maintain their normalization within approximately equal to 1 per cent during their flight. The high sensitivity and absolute inter-comparability of the instruments allow small intensity differences to be detected and it is established that the observed differences can be explained by a magnetospheric screening effect when an anisotropic beam of particles is present in space. Evidence is presented to show that the screening is at times complete for a duration of as much as 110 min in the tail of the magnetosphere so that during this period the solar cosmic rays (E approximately equal to 15 MeV) have virtually no access to that region of the magnetosphere. Small intensity fluctuations of a temporal nature observed and found to be subjected to a damping effect inside the magnetosphere. Author

N74-18421*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DISTRIBUTION OF COSMIC RAYS IN THE GALAXY AND THEIR DYNAMICS AS DEDUCED FROM RECENT GAMMA-RAY OBSERVATIONS
J. L. Puget and F. W. Stecker Jan. 1974 32 p refs
(NASA-TM-X-70597; X-640-74-17) Avail: NTIS HC $4.75 CSCL 03B

Recent data from SAS-2 on the galactic gamma ray line flux as a function of longitude reveal a broad maximum in the gamma ray intensity in the region absolute value of l approximately

smaller than 30 deg. These data imply that the low energy galactic cosmic ray flux varies with galactocentric distance and is about an order of magnitude higher than the local value in a toroidal region between 4 and 5 kpc from the galactic center. This enhancement can be plausibly accounted for by first order Fermi acceleration, compression and trapping of cosmic rays consistent with present ideas of galactic dynamics and galactic structure theory. Calculations indicate that cosmic rays in the 4 to 5 kpc region are trapped and accelerated over a mean time of the order of a few million years or about 2 to 4 times the assumed trapping time in the solar region of the galaxy. Author

N74-18422*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SAS-2 OBSERVATIONS OF THE HIGH ENERGY GAMMA RADIATION FROM THE VELA REGION
D. J. Thompson, G. F. Bignami, C. E. Fichtel, and D. A. Kniffen Feb. 1974 13 p refs
(NASA-TM-X-70602; X-662-74-58) Avail: NTIS HC $4.00 CSCL 03B

Data from a scan of the galactic plane by the SAS-B high energy gamma ray experiment in the region 250 deg smaller than 12 smaller than 290 deg show a statistically significant excess over the general radiation from the galactic plane for gamma radiation of energy larger than 100 MeV. If the enhanced gamma radiation results from interactions of cosmic rays with galactic matter, as the energy spectrum suggests, it seems reasonable to associate the enhancement with large scale galactic features, such as spiral arm segments in that direction, or with the region surrounding the Vela supernova remnant with which PSR 0833-45 is associated. If the excess is attributed to cosmic rays released from the supernova interacting with the interstellar matter in that region, than on the order of 3 x 10 to the 50th power ergs would have been released by that supernova in the form of cosmic rays. Author

N74-18423*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SURFACE COSMIC RAY EXPERIMENT Final Report
P. B. Price 7 Feb. 1974 26 p refs
(Contract NAS9-12005)
(NASA-CR-134196; SSL-Ser-15-Issue-9) Avail: NTIS HC $4.50 CSCL 03B

The galactic cosmic ray and solar flare experiment on Apollo 16 is reported. The published papers presented describe the experiment, equipment, data processing techniques, and operational history. The principle findings include: (1) The composition of heavy ions in interplanetary space at energies between approximately 30 and 130 MeV/nucleon is the same, within experimental errors. (2) The ability of a Lexan stack to determine simultaneously the energy spectra of major elements from He up to Fe in the energy interval 0.2 to 30 MeV/nucleon revealed systematic changes in the composition of solar flare particles as a function of energy. (3) Heavy ions emitted in a solar flare appear to be completely stripped of electrons, and are not in charge equilibrium at the time of acceleration and releases from the sun. F.O.S.

N74-18424*# Kanner (Leo) Associates, Redwood City, Calif.
SOLAR MAGNETIC FIELD MEASUREMENTS
E. H. Schroeter Washington NASA Mar. 1974 15 p refs Transl. into ENGLISH from Astron. Gesellschaft, Mitteilungen, no. 32, 1973 p 55-64
(Contract NASw-2481)
(NASA-TT-F-14757) Avail: NTIS HC $4.00 CSCL 03B

Problems in deriving the magnetic field in a region of solar activity, rather than the results of solar magnetic field measurements are discussed. The Stokes vector and its relationship to the magnetic field vector are described. Sources of error apart from those already known for the still atmosphere are outlined: nonvalidity of hydrostatic equilibrium, scattering, magneto-optical effects, and errors in assumptions about magnetic fields as functions of depth. Existing polarimeters are described, as well as possible vector polarimeters. Estimates are made on detection limits for solar magnetic fields. Author

N74-18425# Osservatorio Astronomico, Rome (Italy).
INFRARED OBSERVATIONS OF RELATIVELY COOL STARS AT 1 PI EQUALS 118 DEG
R. Buonanno (Min. Pubblica Istruzione) and F. Smriglio Sep. 1973 24 p refs
(RR-10) Avail: NTIS HC $4.25

Infrared magnitudes and the space distribution of late type stars brighter than V = 15.0 m as derived from low dispersion objective prism infrared spectra were studied. A region of 15 square degrees in the direction of Cassiopeia centered on RA (1950) = 23h58m, Dec. (1950) = 60 deg 09' was investigated. The first results are shown and an attempt of interpretation of the informations deriving from the Wolf diagram is also exposed. Author (ESRO)

N74-18426# Lund Univ. (Sweden). Dept. of Physics.
THE ENERGY DOSE CONCEPT APPLIED TO HEAVY ION TRACKS IN NUCLEAR EMULSION
L. Jacobsson and R. Rosander Nov. 1973 26 p refs Sponsored in part by Swed. Nat. Sci. Res. Council
(LUIP-CR-73-13) Avail: NTIS HC $4.50

Experimental data on track widths in nuclear emulsion were compared with the theoretical distribution of the energy dose around the path of a moving ion. The dose distribution was calculated following the formalism of the track formation theory. The track widths were estimated from light absorption profiles of heavy ion tracks. The profiles were recorded using a nuclear track photometer with a narrow slit. The tracks were produced by stopping cosmic ray particles with the charges 6, 12, 18, 24, and 26. The measurements cover the residual range interval 0 to 1000 microns, implying ion velocities below 0.33 C. The measured track widths in K2 are described theoretically. Author (ESRO)

N74-18449* Washington Univ., St. Louis, Mo.
MEASUREMENTS OF HEAVY SOLAR WIND AND HIGHER ENERGY SOLAR PARTICLES DURING THE APOLLO 17 MISSION
R. M. Walker, E. Zinner, and M. Maurette (Lab. Rene Bernas, Orsay) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 03B

N74-18450* General Electric Co., Schenectady, N.Y. Research and Development Center.
QUIET TIME ENERGY SPECTRA OF HEAVY NUCLEI FROM 20 TO 400 keV/amu
R. T. Woods (State Univ. of N. Y., Albany), H. R. Hart, Jr., and R. L. Fleischer *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 03B

N74-18451* California Univ., Berkeley.
THE NATURE OF INTERPLANETARY HEAVY IONS WITH 0.1 LESS THAN E LESS THAN 40 MeV/NUCLEON
P. B. Price and J. H. Chan *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 5 p refs (For availability see N74-18428 09-30)
CSCL 03B

N74-18452* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAY SPECTROMETER EXPERIMENT, NaI(Tl) DETECTOR CRYSTAL ACTIVATION
J. I. Trombka, R. L. Schmadebeck, M. Bielefeld (Computer Science Corp.), G. D. OKelley (ORNL), J. S. Eldridge (ORNL), K. J. Northcutt (ORNL), A. E. Metzger (JPL), E. Schonfeld, L. E. Peterson (Calif. Univ., San Diego), J. R. Arnold (Calif. Univ., San Diego) et al *In its* Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 03B

N74-18455* Johns Hopkins Univ., Baltimore, Md.
ULTRAVIOLET SPECTROMETER EXPERIMENT
William G. Fastie, Paul D. Feldman, Richard C. Henry, H. Warren Moos, Charles A. Barth (Colo. Univ.), Gary E. Thomas (Colo. Univ.), Charles F. Lillie (Colo. Univ.), and Thomas M. Donahue (Pittsburgh Univ.) *In* NASA. Johnson Space Center Apollo 17

Prelimin. Sci. Rept. 1973 10 p refs (For availability see N74-18428 09-30)
CSCL 03B

N74-18457* Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).
BIOSTACK EXPERIMENT
H. Buecker, G. Horneck, E. Reinholz (Max Planck Inst. fuer Biophysik, Frankfort), W. Ruether (Marburg Univ.), E. H. Graul (Marburg Univ.), H. Planel (Toulouse Univ.), J. P. Soleilhavoup (Toulouse Univ.), P. Cueer (Strasbourg Univ.), R. Kaiser (Strasbourg Univ.), J. P. Massue (Strasbourg Univ.) et al *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 10 p refs (For availability see N74-18428 09-30)
CSCL 03B

N74-18458* Illinois Univ., Urbana. Abraham Lincoln School of Medicine.
BIOCORE EXPERIMENT
O. T. Bailey, E. V. Benton (San Francisco Univ.), M. R. Cruty (San Francisco Univ.), G. A. Harrison (NASA. Ames Res. Center), W. Haymaker (NASA. Ames Res. Center), G. Humason (Oak Ridge Associated Universities), H. A. Leon (NASA. Ames Res. Center), R. L. Lindberg (Northorp Corporate Labs.), B. C. Look (NASA. Ames Res. Center), C. C. Lushbaugh (Oak Ridge Associated Universities) et al *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 14 p refs (For availability see N74-18428 09-30)
CSCL 03B

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-18427*# Aerospace Corp., El Segundo, Calif. Systems Planning Div.
OPERATIONS ANALYSIS (STUDY 2.6). VOLUME 1: EXECUTIVE SUMMARY Final Report
R. R. Wolfe 15 Sep. 1973 29 p refs
(Contract NASw-2472)
(NASA-CR-136946; ATR-74(7336)-3-Vol-1) Avail: NTIS CSCL 22A

Alternative STS operational concepts were examined for the future which have the potential of providing economic benefits. The total concept was examined at a system level involving mission requirements, payload design options, and logistic vehicle definitions. The emphasis was directed toward assessing typical mission characteristics and searching for alternative means to improve the operational capability of the STS system as a whole. Improved utilization of the shuttle and tug upper stage for payload deployment and retrieval was addressed first. Further improvement was developed by modifying the payload design and operational approach to allow space servicing with the promise of future economic improvement. Multiple mission satellites and alternate upper stages were also examined, including a brief look at solar electric propulsion stages and in-space warehousing of space replaceable payload modules. The conclusions strongly point toward new space-servicing concepts which inherently improve the efficiency of future space operations. The results of various tradeoffs point to space servicing as a means of reducing overall program costs including payload acquisition and logistic vehicle operations. Author

N74-18428*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO 17 PRELIMINARY SCIENCE REPORT
Washington 1973 677 p refs Original contains color illustrations
(NASA-SP-330; JSC-S-381; LC-73-600152) Avail: NTIS MF $1.45; SOD HC $7.95 CSCL 22C

An analysis of the Apollo 17 flight is presented in the form of a preliminary science report. The subjects discussed are: (1) Apollo 17 site selection, (2) mission description, (3) geological investigation of landing site, (4) lunar experiments, (5) visual flight flash phenomenon, (6) volcanic studies, (7) mare ridges and related studies, (8) remote sensing and photogrammetric studies, and (9) astronomical photography. Extensive photographic data are included for all phases of the mission. For individual titles, see N74-18429 through N74-18485.

N74-18429* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTRODUCTION
Anthony J. Calio *In its* Apollo 17 Prelim. Sci. Rept. 1973 5 p (For availability see N74-18428 09-30)
CSCL 22C

The accomplishments of the Apollo 17 flight are briefly described. The characteristics of the Taurus-Littrow region landing site are analyzed. The experiments conducted to analyze the composition of the lunar surface are reported. The extent to which the results of the Apollo 17 experiments confirmed theories concerning lunar seismology, thermal characteristics, presence of radioactive materials, and origin of the moon is developed. P.N.F.

N74-18430* National Aeronautics and Space Administration, Washington, D.C.
APOLLO 17 SITE SELECTION
N. W. Hinners *In its* Apollo 17 Prelim. Sci. Rept. 1973 5 p ref (For availability see N74-18428 09-30)
CSCL 22A

The scientific arguments and recommendations concerning the selection of the Apollo 17 landing site are presented. The final selection was influenced by the accomplishments and circumstances of previous Apollo flights and by the proposed experiments for Apollo 17. The decisive factors in selecting the Taurus-Littrow landing area were: (1) certainty of acquiring highlands lunar samples, (2) superior orbital coverage, and (3) better use of the lunar roving vehicle capabilities. P.N.F.

N74-18431* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MISSION DESCRIPTION
Richard R. Baldwin *In its* Apollo 17 Prelim. Sci. Rept. 1973 10 p ref (For availability see N74-18428 09-30)
CSCL 22C

The accomplishments of the Apollo 17 flight are discussed. The scientific objectives included geological surveying and sampling of materials and surface features in a preselected area of the Taurus-Littrow region, deploying and activating surface experiments, and conducting inflight experiments and photographic tasks during lunar orbit and transearth coast. The individual Apollo 17 experiments and photographic tasks are presented in outline form. Charts are developed to show the major mission events and data collection periods correlated to Greenwich Mean Time and ground elapsed time. Maps of the lunar surface ground track envelope for the Apollo 17 orbiting spacecraft for revolutions one to seventy-five is shown. P.N.F.

N74-18432* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUMMARY OF SCIENTIFIC RESULTS
Robert A. Parker *In its* Apollo 17 Prelim. Sci. Rept. 1973 7 p (For availability see N74-18428 09-30)
CSCL 22C

The accomplishments of the Apollo 17 flight are summarized. The basic objective of the mission was to sample basin-rim highland material and adjacent mare material and to investigate the geological evolutionary relationship between these two major units. The lunar experiments which were conducted include: (1) lunar field geology, (2) surface electrical experiments, (3) lunar traverse gravimeter experiments, (4) lunar seismic profiling experiment, (5) lunar ejecta and meteorites experiment, (6) analysis of lunar atmosphere composition, and (7) heat flow experiments. P.N.F.

N74-18433* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex. c14
PHOTOGRAPHIC SUMMARY
M. C. McEwen and Vel S. Clanton *In its* Apollo 17 Prelim. Sci.

Rept. 1973 32 p (For availability see N74-18428 09-30)
CSCL 14E

The photographic objectives of the Apollo 17 mission are discussed. The photographic requirements are divided into lunar surface photographs and orbital photographic tasks. The cameras used during the mission are listed and a general description of the tasks for which each was used is provided. Examples of photographs taken during lunar orbit and on the lunar surface are included. The cameras used and the photographic coverage obtained during specific phases of the mission are reported. P.N.F.

N74-18434* Brown Univ., Providence, R.I.
NEAR-TERMINATOR AND EARTHSHINE PHOTOGRAPHY
c14
James W. Head and Douglas Lloyd (Bell Telephone Labs.) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 7 p refs (For availability see N74-18428 09-30)
CSCL 14E

Photographic results obtained during the Apollo 17 flight for the near terminator and earthshine conditions are discussed. Lunar surface photographs taken in the vicinity of the sunshine terminator provide important information that is not obtained on photographs taken at higher sun evaluation angles. Earthshine photography also provides data on low relief, crater morphology, and small scale structures. Examples of photographs of the lunar surface taken under both conditions are provided. P.N.F.

N74-18435* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A GEOLOGICAL INVESTIGATION OF THE TAURUS-LITTROW VALLEY
Harrison H. Schmitt and Eugene A. Cernan *In its* Apollo 17 Prelim. Sci. Rept. 1973 21 p refs (For availability see N74-18428 09-30)
CSCL 03B

The geological characteristics of the Taurus-Littrow region in the mountainous southeastern ring of the great plain of the Mare Serenitatis are presented. The major geologically defined units within the valley and the mountains surrounding it were examined during the Apollo 17 mission. The data obtained during the geological analysis are presented. Photographs of the significant formations are included. The specific nature of the rock formations and the stratigraphy of the area are discussed. P.N.F.

N74-18436* Geological Survey, Washington, D.C.
PRELIMINARY GEOLOGIC INVESTIGATION OF THE APOLLO 17 LANDING SITE
W. R. Muehlberger (Tex. Univ., Austin), R. M. Batson, E. A. Cernan (NASA. Johnson Space Center), V. L. Freeman, M. H. Hait, H. E. Holt, K. A. Howard, E. D. Jackson, K. B. Larson, V. S. Reed et al *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 91 p refs (For availability see N74-18428 09-30)
CSCL 03B

A geological investigation of the Apollo 17 lunar landing site was conducted. The Taurus-Littrow valley is interpreted as a deep graben formed by structural adjustment of lunar crustal material to the Serenitatis impact. Materials of the valley fill were sampled at many stations. Ejecta around many craters on the valley floor consist of basalt, showing that the graben was partly filled by lava flows. The geological objectives of the Apollo 17 mission are divided into orbital and lunar surface data collection. The data obtained for both types of investigation are presented in tables, photographs, and drawings. P.N.F.

N74-18437* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PRELIMINARY EXAMINATION OF LUNAR SAMPLES
In its Apollo 17 Prelim. Sci. Rept. 1973 46 p refs (For availability see N74-18428 09-30)
CSCL 03B

An analysis of the lunar samples returned by Apollo 17 was conducted to determine the petrographic characteristics. A table listing all the rocks returned by Apollo 17 by sample number, weight, and rock type is presented. Photographs of lunar samples are included to show the variety of rocks returned. Lunar soils were collected to aid in characterizing the four major photogeologic units determined by preflight studies. Tables are developed to show grain size and grain type for the lunar soils. Radiographs of the drive tubes are interpreted to show the formations existing at various depths below the lunar surface. P.N.F.

N74-18438* California Univ., Berkeley.
SOIL MECHANICS
James K. Mitchell, W. David. Carrier, III (NASA. Johnson Space Center), Nicholas C. Costes (NASA. Marshall Space Flight Center), William N. Houston, Ronald F. Scott (Calif. Inst. of Tech.), and H. John Hovland (Pacific Gas and Elec. Co.) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 22 p refs (For availability see N74-18428 09-30)
CSCL 08M

The soil mechanics experiment on the Apollo 17 mission to the Taurus-Littrow area of the moon is discussed. The objectives of the experiment were to determine the physical characteristics and mechanical properties of the lunar soil at the surface and subsurface in lateral directions. Data obtained on the lunar surface in conjunction with observations of returned samples of lunar soil are used to determine in-place density and porosity profiles and to determine strength characteristics on local and regional scales. P.N.F.

N74-18439* Lamont-Doherty Geological Observatory, Palisades, N.Y.
HEAT FLOW EXPERIMENT
Marcus G. Langseth, Jr., Stephen J. Keihm, and John L. Chute, Jr. (City Univ. of N. Y.) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 24 p refs (For availability see N74-18428 09-30)
CSCL 03B

The heat flow experiment conducted during the Apollo 17 flight in the Taurus-Littrow area of the moon is discussed. The concept of the experiment is based on the direct measurement of the vertical flow of heat through the regolith. The measurement is made far enough below the surface so that the time-varying heat flow resulting from the very large diurnal variations of the surface temperature is small as compared with the flow from the interior. The equipment used for the experiment is described and illustrated. Graphs are developed to present the results of heat flow and surface temperature measurements. P.N.F.

N74-18440* Stanford Univ., Calif.
LUNAR SEISMIC PROFILING EXPERIMENT
Robert L. Kovach, Joel S. Watkins (Tex. Univ., Galveston), and Pradeep Talwani *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 12 p refs (For availability see N74-18428 09-30)
CSCL 03B

The Apollo 17 lunar seismic profiling experiment was conducted to record the vibrations of the lunar surface as induced by explosive charges, the thrust of the lunar module ascent engine, and the crash of the lunar module ascent stage. Analysis of the data obtained made it possible to determine the internal characteristics of the lunar crust to a depth of several kilometers. The test equipment used in the experiment is described. Maps showing the location of the geophones and the deployed explosive packages are provided. Samples of the seismic signals recorded by the lunar seismic profiling experiment geophones are included. P.N.F.

N74-18441* Texas Univ., Galveston.
PASSIVE SEISMIC EXPERIMENT
Gary V. Latham, Maurice Ewing, Frank Press (MIT), James Dorman, Yosio Nakamura, Nafi Toksoz (MIT), Davis Lammlein, Fred Duennebier, and Anton Dainty (MIT) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 03B

The network of seismometers installed by the Apollo 17 and other Apollo missions is described. The effects of the impacts of lunar modules and S-4B stages on the lunar surfaces are discussed. The information concerning lunar composition which is obtained by analyzing the seismic signals generated by moonquakes and meteoroid impacts are analyzed. It is concluded

that the seismic activity within the moon is extremely low compared to that with the earth. The moon is characterized by a rigid, dynamically inactive outer shell, approximately 1000 kilometers thick, surrounding a core that has markedly different elastic properties. Author

N74-18442* Maryland Univ., College Park.
LUNAR SURFACE GRAVIMETER EXPERIMENT
John J. Giganti, J. V. Larson, J. P. Richard, and J. Weber *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 03B

The lunar surface gravimeter which was emplaced on the moon by the Apollo 17 flight is described and a schematic diagram of the sensor is provided. The objective of the lunar surface gravimeter is to use the moon as an instrumented antenna to detect gravitational waves. Another objective is to measure tidal deformation of the moon. Samples of signals received during lunar sunrise activity and during quiet periods are presented in graph form based on power spectrum analysis P.N.F.

N74-18443* Lamont-Doherty Geological Observatory, Palisades, N.Y.
TRAVERSE GRAVIMETER EXPERIMENT
Manik Talwani, George Thompson (Stanford Univ.), Brian Dent (Stanford Univ.), Hans-gert Kahle, and Sheldon Buck (MIT) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 13 p refs (For availability see N74-18428 09-30)
CSCL 03B

The primary goal of the traverse gravimeter experiment (TGE) was to make relative gravity measurements at a number of sites in the Apollo 17 landing area and to use these measurements to obtain information about the geological substructure. A secondary goal was to obtain the value of the gravity at the landing site relative to an accurately known value on earth. Both these goals were successfully achieved by the experiment. A gravity tie has been obtained between the Taurus-Littrow landing site and the earth with an estimated accuracy of approximately 5 mgal. Relative gravity measurements that can be used to infer the substructure of the area have been obtained at stations visited during each period of extravehicular activity (EVA). Author

N74-18444* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
S-BAND TRANSPONDER EXPERIMENT
W. L. Sjogren, W. R. Wollenhaupt (NASA. Johnson Space Center), and R. N. Wimberly *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 03B

The purpose of this experiment was to measure the variations in the lunar gravitational field near the trajectory of orbiting space vehicles (the command and service module (CSM) and the small particles and fields subsatellites ejected from the Apollo 15 and 16 spacecraft). New information has been obtained from all Apollo orbiting spacecraft; however, this report shall be limited to the results from the Apollo 17 CSM and the Apollo 16 subsatellite. The data acquired are precise speed measurements of the orbiting spacecraft from which accelerations or gravity profiles may be inferred. Feature resolution is controlled by the spacecraft altitude and is almost a direct relationship (i.e., data taken from a 50-km altitude will resolve approximately a 50-km feature). Therefore, revolutions 3 to 12, when the CSM was in the low-altitude orbits, provided the clearest information. Author

N74-18445* Massachusetts Inst. of Tech., Cambridge.
SURFACE ELECTRICAL PROPERTIES EXPERIMENT
Gene Simmons, David Strangway (NASA. Johnson Space Center), Peter Annan (Toronto Univ.), Richard Baker, Lawrence Bannister, Raymon Brown, William Cooper, Dean Cubley (NASA. Johnson Space Center), Joseph DeBettencourt (Raytheon Co.), and Anthony W. England (USGS) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 14 p refs (For availability see N74-18428 09-30)
CSCL 03B

The surface electrical properties (SEP) experiment was used to explore the subsurface material of the Apollo 17 landing site by means of electromagnetic radiation. The experiment was designed to detect electrical layering, discrete scattering bodies, and the possible presence of water. From the analysis of the data, it was expected that values of the electrical properties (dielectric constant and loss tangent) of lunar material in situ would be obtained. The basic principle of the SEP experiment is interferometry. This principle involves only the interference of two or more waves to produce an interference pattern. The inversion of the interference pattern in terms of the spatial distribution of the electrical properties is the basic aim of the experiment (fig. 15-1). The experiment is most easily understood in terms of a single dipole antenna for radiating electromagnetic energy and a loop receiver for measuring the magnitudes of the fields. Author

N74-18446* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LUNAR EJECTA AND METEORITES EXPERIMENT
O. E. Berg, F. F. Richardson, and H. Burton *In its* Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 03B

The test equipment installed during the Apollo 17 flight to conduct the lunar ejecta and meteorites (LEAM) investigation is described. The LEAM experiment intercepts ejecta particles created by meteoroid impact on the lunar surface and records information useful in establishing the history of the moon. The deployment of the system in the Taurus-Littrow area and the method for controlling the equipment are explained. The effects of lunar surface temperatures on the operation of the sensors are reported. P.N.F.

N74-18447* Texas Univ., Dallas.
LUNAR ATMOSPHERIC COMPOSITION EXPERIMENT c13
J. H. Hoffman, R. R. Hodges, Jr., F. S. Johnson, and D. E. Evans (NASA. Johnson Space Center) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 04A

On the Apollo 17 mission, a miniature mass spectrometer, called the lunar atmospheric composition experiment (LACE), was carried to the moon as part of the Apollo lunar surface experiments package (ALSEP) to study the composition of and variation in the lunar atmosphere. The instrument was successfully deployed in the Taurus-Littrow valley with its entrance aperture oriented upward to intercept and measure the downward flux of gases at the lunar surface. Initial activation of the LACE instrument occurred on December 27, 1972, approximately 50 hr after sunset, and operation continued throughout the first lunar night. Sunrise brought a high background gas level and necessitated discontinuing operation during lunar daytime except for a brief check near noon. Near sunset, operation was resumed and continued throughout the night. This sequence was repeated for the second and third lunations. Author

N74-18448* California Inst. of Tech., Pasadena.
LUNAR NEUTRON PROBE EXPERIMENT
Dorothy S. Woolum, D. S. Burnett, and C. A. Bauman *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 12 p refs (For availability see N74-18428 09-30)
CSCL 03B

Preliminary results of the Apollo 17 neutron probe are presented. The probe which was designed for measuring neutron capture rates to a depth of 2m in the lunar regolith is described, and the fission rates for U-235 are discussed. It is concluded that good agreement exists between the experimental results and theoretical calculations. F.O.S.

N74-18449* Washington Univ., St. Louis, Mo.
MEASUREMENTS OF HEAVY SOLAR WIND AND HIGHER ENERGY SOLAR PARTICLES DURING THE APOLLO 17 MISSION c29
R. M. Walker, E. Zinner, and M. Maurette (Lab. Rene Bernas, Orsay) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 03B

The lunar surface cosmic ray experiment, consisting of sets of mica, glass, plastic, and metal foil detectors, was successfully deployed on the Apollo 17 mission. One set of detectors was exposed directly to sunlight and another set was placed in shade. Preliminary scanning of the mica detectors shows the expected registration of heavy solar wind ions in the sample exposed directly to the sun. The initial results indicate a depletion of very-heavy solar wind ions. The effect is probably not real but is caused by scanning inefficiencies. Despite the lack of any pronounced solar activity, energetic heavy particles with energies extending to > 1 MeV/nucleon were observed. Equal track densities of approximately 6000 tracks/cm sq > 0.5 microns in length were measured in mica samples exposed in both sunlight and shade. Author

N74-18450* General Electric Co., Schenectady, N.Y. Research and Development Center.
QUIET TIME ENERGY SPECTRA OF HEAVY NUCLEI FROM 20 TO 400 keV/amu c29
R. T. Woods (State Univ. of N. Y., Albany), H. R. Hart, Jr., and R. L. Fleischer *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 03B

Glass track detectors were exposed to cosmic rays on the moon from December 11 to 13, 1972, during a period of relatively quiet sun activity as inferred from satellite proton counters. From 80 to 400 keV/amu, the differential flux of heavy cosmic ray nuclei decreases roughly as E to the -2nd power; this result together with the greater flux from the solar than the antisolar direction identify these nuclei as solar in origin. Author

N74-18451* California Univ., Berkeley.
THE NATURE OF INTERPLANETARY HEAVY IONS WITH 0.1 LESS THAN E LESS THAN 40 MeV/NUCLEON c29
P. B. Price and J. H. Chan *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 5 p refs (For availability see N74-18428 09-30)
CSCL 03B

The populations of interplanetary particles were studied by examining the energy spectra in a cosmic ray detector placed in the shade, facing away from the sun. Suprathermal ions of solar origin, and low-energy galactic cosmic rays are discussed. F.O.S.

N74-18452* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAY SPECTROMETER EXPERIMENT, NaI(Tl) DETECTOR CRYSTAL ACTIVATION c29
J. I. Trombka, R. L. Schmadebeck, M. Bielefeld (Computer Science Corp.), G. D. OKelley (ORNL), J. S. Eldridge (ORNL), K. J. Northcutt (ORNL), A. E. Metzger (JPL), E. Schonfeld, L. E. Peterson (Calif. Univ., San Diego), J. R. Arnold (Calif. Univ., San Diego) et al *In its* Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 03B

Preliminary results are presented of data on the extent of the cosmic ray-induced activity obtained by a sodium iodide thallium-activated crystal flown onboard the Apollo 17 command module. Qualitative identification is reported for the following: Na-24, I-123, I-124, I-125, I-126, and Xe-127. F.O.S.

N74-18453* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO WINDOW METEOROID EXPERIMENT
Burton G. Cour-Palais *In its* Apollo 17 Prelimin. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 03B

Apollo command module heat shield windows were examined for meteoroid impacts to obtain information about (1) the flux of meteoroids with masses of 10 to the -7th g and less, (2) dynamic and physical properties of meteoroids, and (3) correlations with lunar-rock-crater studies. The results of examining Apollo 17, and nine prior Apollo windows are tabulated. The window exposure time, number of impacts, crater diameter, flux, energy, and mass are shown. F.O.S.

N74-18454* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APOLLO LUNAR SOUNDER EXPERIMENT
R. J. Phillips, G. F. Adams (Environ. Res. Inst. of Mich.), W. E. Brown, Jr., R. E. Eggleton (USGS), P. Jackson (Environ. Res. Inst. of Mich.), R. Jordan, W. I. Linlor, W. J. Peeples (Utah Univ.), L. J. Porcello (Environ. Res. Inst. of Mich.), J. Ryu (Utah Univ.) et al *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 26 p refs (For availability see N74-18428 09-30)
CSCL 03B

The four basic data products from the ALSE are sounding, profiling, imaging, and noise measurements. Attention was concentrated on the first three products, and both theory and preliminary results are presented. Background information is presented on the experiment and on the data products. Preliminary examples of the types of analyses that can be performed and the conclusions to which they can lead are included. Preliminary analysis of the data for subsurface features was successful in indicating with a high probability the capability of the ALSE to achieve its fundamental goal of substrate sounding. The imagery and profiling data are useful immediately for geologic interpretation, as demonstrated. Author

N74-18455* Johns Hopkins Univ., Baltimore, Md.
ULTRAVIOLET SPECTROMETER EXPERIMENT c29
William G. Fastie, Paul D. Feldman, Richard C. Henry, H. Warren Moos, Charles A. Barth (Colo. Univ.), Gary E. Thomas (Colo. Univ.), Charles F. Lillie (Colo. Univ.), and Thomas M. Donahue (Pittsburgh Univ.) *In* NASA. Johnson Space Center Apollo 17 Prelimin. Sci. Rept. 1973 10 p refs (For availability see N74-18428 09-30)
CSCL 03B

The ultraviolet spectrometer (UVS) onboard the Apollo 17 orbiting spacecraft was used to measure emissions from the lunar atmosphere. The UVS and calibration are discussed along with the lunar atmosphere observations and lunar albedo measurements. F.O.S.

N74-18456* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INFRARED SCANNING RADIOMETER c13
F. J. Low (Ariz. Univ.) and W. W. Mendell *In its* Apollo 17 Prelim. Sci. Rept. 1973 6 p refs (For availability see N74-18428 09-30)
CSCL 04A

The Apollo 17 infrared scanning radiometer (ISR) experiment for mapping lunar surface thermal emission is reported. The instrument, lunar surface coverage, and the data obtained are discussed. F.O.S.

N74-18457* Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).
BIOSTACK EXPERIMENT c29
H. Buecker, G. Horneck, E. Reinholz (Max Planck Inst. fuer Biophysik, Frankfort), W. Ruether (Marburg Univ.), E. H. Graul (Marburg Univ.), H. Planel (Toulouse Univ.), J. P. Soleilhavoup (Toulouse Univ.), P. Cueer (Strasbourg Univ.), R. Kaiser (Strasbourg Univ.), J. P. Massue (Strasbourg Univ.) et al *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 10 p refs (For availability see N74-18428 09-30)
CSCL 03B

The Apollo 17 biostack experiment to establish the biological efficiency of individual heavy nuclei particles of galactic cosmic radiation are reported. The experiment theory, interaction of heavy nuclei particles with biologic matter, and the total dose of cosmic ionizing radiation are discussed along with the radiation effects of heavy nuclei on Artemia salina eggs, and Bacillus subtilis. F.O.S.

N74-18458* Illinois Univ., Urbana. Abraham Lincoln School of Medicine.
BIOCORE EXPERIMENT c29
O. T. Bailey, E. V. Benton (San Francisco Univ.), M. R. Cruty (San Francisco Univ.), G. A. Harrison (NASA. Ames Res. Center), W. Haymaker (NASA. Ames Res. Center), G. Humason (Oak Ridge Associated Universities), H. A. Leon (NASA. Ames Res. Center), R. L. Lindberg (Northorp Corporate Labs.), B. C. Look

(NASA. Ames Res. Center), C. C. Lushbaugh (Oak Ridge Associated Universities) et al *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 14 p refs (For availability see N74-18428 09-30)
CSCL 03B

The Apollo 17 biological cosmic ray experiment to determine the effect of heavy cosmic ray particles on the brain and eyes is reported. The pocket mouse was selected as the biological specimen for the experiment. The radiation monitors, animal autopsy and animal processing are described, and the radiation effects on the scalp, retina, and viscera are analyzed. F.O.S.

N74-18459* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VISUAL LIGHT FLASH PHENOMENON **c04**
L. S. Pinsky (Houston Univ.), W. Z. Osborne (Houston Univ.), and J. V. Bailey *In its* Apollo 17 Prelim. Sci. Rept. 1973 6 p refs (For availability see N74-18428 09-30)
CSCL 06P

Light flash phenomenon observed by crewmen on Apollo 14, 15, 16, and 17 are analyzed. The passage of cosmic rays through the crewman's head and eyes was recorded by the Apollo light flash moving emulsion detector. Events of all the light flash observations are tabulated. It is suggested that the most probable explanation of the phenomenon is that it is caused by cosmic rays penetrating the eyes and retinas of the observers. F.O.S.

N74-18460* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
GEOLOGICAL OBSERVATIONS FROM LUNAR ORBIT
R. E. Evans and Farouk El-Baz (Smithsonian Inst.) *In its* Apollo 17 Prelim. Sci. Rept. 1973 32 p refs (For availability see N74-18428 09-30)
CSCL 03B

The visual observations of the lunar surface from the command module of the Apollo 17 flight are presented. Detailed descriptions of the observation sites are given. F.O.S.

N74-18461* Geological Survey, Washington, D.C.
BASALT STRATIGRAPHY OF SOUTHERN MARE SERENITATIS
K. A. Howard, M. H. Carr, and W. R. Muehlberger (Tex. Univ., Austin) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 12 p refs (For availability see N74-18428 09-30)
CSCL 03B

The major features of the stratigraphic and structural sequence are summarized for Mare Serenitatis. The dark oldest basalts include flows coextensive with Mare Tranquillitatis and also flows and pyroclastic deposits (dark mantles) that erupted from the edge of the Serenitatis basin. The basin sagged, possibly isostatically, as basalts of intermediate age were emplaced. Sagging had nearly ceased by the time the youngest flows were deposited. Compressive movements including thrusting followed, and small extensional fissures formed in late Copernican time. The revised stratigraphic sequence that was elaborated has implications for lunar stratigraphy that transcend the boundaries of Mare Serenitatis. Dark mantle deposits and the darkest maria have commonly been assumed in geologic mapping to be relatively youthful. These assumptions must now be reevaluated and perhaps discarded. Author

N74-18462* Geological Survey, Washington, D.C.
GEOLOGIC SETTING OF THE DARK MANTLING MATERIAL IN THE TAURUS-LITTROW REGION OF THE MOON
B. K. Lucchitta *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 13 p refs (For availability see N74-18428 09-30)
CSCL 03B

The dark mantle along the southeastern margin of the Serenitatis basin is discussed in terms of its relation to the surrounding areas. The characteristics, and the relationship to younger formations are analyzed. F.O.S.

N74-18463* Geological Survey, Washington, D.C.
RELATIVE AGES OF SOME NEAR-SIDE MARE UNITS BASED ON APOLLO 17 METRIC PHOTOGRAPHS
Joseph M. Boyce and Arthur L. Dial, Jr. *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 3 p refs (For availability see N74-18428 09-30)
CSCL 03B

Relative flux ages were determined for 110 areas on parts of Serenitatis, Vaporum, and Imbrium, using Apollo 17 metric photographs. The crater-morphology technique for determining relative ages is described. It is concluded that these maria formed over an interval of 1.5 billion years, extending from 3.7 to 2.2 billion years ago. F.O.S.

N74-18464* Geological Survey, Washington, D.C.
GEOLOGIC MAP OF THE NORTHERN CRISIUM REGION
Don E. Wilhelms *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 7 p refs (For availability see N74-18428 09-30)
CSCL 03B

Apollo 17 metric photographs provide the best available coverage for geologic interpretation of northern Mare Crisium and the northern Crisium basin. One region in particular, between Alhazen Crater and longitude 66 E, had previously been covered very poorly. The Apollo 17 photographs provide excellent monoscopic as well as stereoscopic viewing because of the favorably low sun illuminations (15 deg to 49 deg). These new photographic data allow the geology of the basin, the mare, and other nearby terrains to be reevaluated. This reexamination, together with data from continuing moon-wide photogeologic studies and analyses of returned rocks from Apollo landing sites, has produced a simple evolutionary picture of the region, expressed by fewer map units and explained by fewer basic processes than previously thought necessary. Author

N74-18465* Santa Clara Univ., Calif.
COMPARATIVE GEOLOGY OF CRATER ARATUS CA (MARE SERENITATIS) AND BEAR CRATER (IDAHO)
Ronald Greeley *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 6 p refs (For availability see N74-18428 09-30)
CSCL 08F

Aratus CA (lat. 24.5 N, long. 11.3 E) is an irregular-shaped crater 8.6 km long by 3 km wide in western Mare Serenitatis, which was photographed during the Apollo 15 and 17 missions. It is similar in form to Bear Crater (fig. 30-2), a small volcanic vent formed in Holocene basalt flows of the Snake River Plains, Idaho. The two features are compared and it is concluded that Aratus CA may have a geologic structure and history similar to that of Bear Crater. Author

N74-18466* Geological Survey, Washington, D.C.
MARE SERENITATIS CINDER CONES AND TERRESTRIAL ANALOGS
David H. Scott *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 2 p refs (For availability see N74-18428 09-30)
CSCL 03B

Volcanic cones in the Serenitatis basin are compared to terrestrial volcanic formations. Cinder cones, basalt flows and their morphology are discussed. F.O.S.

N74-18467* Woods Hole Oceanographic Institution, Mass.
SOME VOLCANIC AND STRUCTURAL FEATURES OF MARE SERENITATIS
W. B. Bryan and M.-L. Adams *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 08F

Relationships between volcanic and structural features along the southern edge of Mare Serenitatis as determined from low angle lighting in Apollo 17 photographs are discussed. Observational summaries are given of: (1) contact relations between the dark border material and the central mare fill, (2) a late stage lava flow with associated cinder cones, and (3) certain structural features related to the development of the mare basin and its associated volcanic landforms. A chronologic summary is given of volcanic and structural events believed to be critical to understanding the development of Mare Serenitatis. Author

N74-18468* Smithsonian Institution, Washington, D.C. National Air and Space Museum.

D-CALDERA: NEW PHOTOGRAPHS OF A UNIQUE FEATURE
Farouk El-Baz *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 03B

Apollo 17 data on the setting and detailed characteristics of the D-Caldera structure are analyzed. Data are also given on the formation of the structure. E.H.W.

N74-18469* Geological Survey, Washington, D.C.
ERATOSTHENIAN VOLCANISM IN MARE IMBRIUM: SOURCE OF YOUNGEST LAVA FLOWS
Gerald G. Schaber *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 03B

Orbital photographic documentation of lava flow in the southwestern Mare Imbrium by Apollo 17 are introduced. A detailed photogeologic evaluation of these flows and their role in mare volcanism of the Eratosthenian age in the basin is included. Special attention was given to the source of phase 3, the youngest lava flows. E.H.W.

N74-18470* State Univ. of New York, Genesco.
VOLCANISM IN THE LUNAR MARIA
Richard A. Young, William J. Brennan, Robert W. Wolfe, and Douglas J. Nichols *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 11 p refs (For availability see N74-18428 09-30)
CSCL 03B

The formation, modification, and deformation of lunar maria by extended volcanic and tectonic processes are examined. Data also cover lava flows, sinuous rilles, mare ridges, faults, and fracture systems. Stages involved in the modification of impact craters by tectonism, volcanism, younger impacts, and mass wasting are included. E.H.W.

N74-18471* Geological Survey, Washington, D.C.
MARE RIDGES AND LAVA LAKES
Carroll Ann Hodges *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 10 p refs (For availability see N74-18428 09-30)
CSCL 03B

The autointrusive hypothesis of the origin of several vagaries of prominent mare ridges is explained. Data are based on a comparison between the structure of a Hawaiian lava lake and the mare rediges. Resulting data suggest that these ridges may have formed as squeeze-ups and autointrusives in tension fractures over buried topography in the crust of luna lava lakes. Data also suggest that mare ridges may result from: (1) pressure ridges in flows, (2) compressional features resulting from subsidence of mare lava, (3) volcanic ring structures and extrusives, or loccoliths fed by lunar grid controlled dikes, (4) draped topography and fissure eruptives, (5) drag folds or tension-gash dikes caused by wrench faulting at depth, and (6) postmare thrust faults. E.H.W.

N74-18472* Geological Survey, Washington, D.C.
LUNAR THRUST FAULTS IN THE TAURUS-LITTROW REGION
K. A. Howard and W. R. Muehlberger (Tex. Univ., Austin) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 3 p refs (For availability see N74-18428 09-30)
CSCL 03B

Evidence, suggesting that wrinkle ridges and similar looking one-sided scrapes in the Taurus-Littrow region are caused by anticlines and thrust faults resulting from sliding on a flowing surface, is given. E.H.W.

N74-18473* Geological Survey, Washington, D.C.
SMALL STRUCTURES OF THE TAURUS-LITTROW REGION
David H. Scott *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 5 p refs (For availability see N74-18428 09-30)
CSCL 03B

Apollo 17 photographs of small structures expressed as scarps, ledges, flow fronts, and mare type ridges are compared in an effort to determine the origin of such structures. The resulting data revealed that these structures were probably developed as lava extrusions from fractures and fissures along with associated faulting and folding. E.H.W.

N74-18474* Geological Survey, Washington, D.C.
LUNAR CRATER MORPHOMETRY
Richard J. Pike *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 7 p refs (For availability see N74-18428 09-30)
CSCL 08F

A general study is presented on the surface geometry of 25 far-side craters along with a detailed study of rim-crest evenness for 15 near-side and far-side craters. Analysis of this preliminary sample of Apollo 15 and 17 data, which includes craters between 1.5 and 275 km in diameter, suggests that most genetic interpretations of craters made from pre-Apollo topographic measurements may require no drastic revision. All measurements were made from topographic profiles generated on a stereoplotter. Author

N74-18475* Smithsonian Institution, Washington, D.C. National Air and Space Museum.
AITKEN CRATER AND ITS ENVIRONS
Farouk El-Baz *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 5 p refs (For availability see N74-18428 09-30)
CSCL 08F

The physical characteristics of the fresh looking Aitken Crater and its surrounding environment are studied. Rim deposits and ejecta blanket indicate the crater has a probable impact origin or is formed during post-Aitken events. Data also indicate the crater's dark floor fill, its flow scarps, and smaller craters with domical structures are volcanic in origin. Landform varieties suggest episodic erruptions may also cause such craters. E.H.W.

N74-18476* Woods Hole Oceanographic Institution, Mass.
VOLCANIC FEATURES OF FAR SIDE CRATER AITKEN
W. B. Bryan and M.-L. Adams *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 2 p refs (For availability see N74-18428 09-30)
CSCL 08F

Volcanic features of the far side Aitken Crater including post-impact volcanism and volcanic events extending beyond the period of mare type crater flooding are discussed. The features attributed to extrusions of viscous lava are also discussed. E.H.W.

N74-18477* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE LUNAR HERRINGBONE PATTERN
Verne R. Oberbeck and Robert H. Morrison *In its* Apollo 17 Prelim. Sci. Rept. 1973 15 p refs (For availability see N74-18428 09-30)
CSCL 03B

Several defined examples of the V shaped components of herringbone patterns observed on Apollo 17 and Apollo 15 metric and panoramic photographs are given along with an explanation on the impact mechanism for forming the V shaped structures. Observations of isolated crater chains having the herringbone patterns but not obviously associated with any primary crater are also included. Preliminary results indicate the lunar herringbone patterns are common to characteristics of secondary cratering and that the pattern results from the collision of material ejected from separated impact points. E.H.W.

N74-18478* Geological Survey, Washington, D.C.
REMOTE SENSING OF MARE SERENITATIS
T. W. Thompson (JPL), K. A. Howard, R. W. Shorthill (Boeing Aerospace Co.), G. L. Tyler (Stanford Univ.), S. H. Zisk (MIT), E. A. Whitaker (Arizona Univ.), G. G. Schaber, and H. J. Moore *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 7 p refs (For availability see N74-18428 09-30)
CSCL 03B

An examination was made of earth based observations of optical color differences, infrared eclipse temperatures, and radar backscatter for Mare Serenitatis. Information is also included on

orbital observations, physical properties of surface types, and correlation of surface types with geologic units. Differences in these remote observations are attributed to variations in chemical and minerological compositions. E.H.W.

N74-18479* Geological Survey, Washington, D.C.
CALIBRATION OF RADAR DATA FROM APOLLO 17 AND OTHER MISSION RESULTS c07
H. J. Moore and S. H. Zisk (MIT) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 7 p refs (For availability see N74-18428 09-30)
CSCL 17I

An examination was made of radar data on depolarized radar echoes for the general areas of (1) the Apollo 11, 12, 14, 15, 16, and 17 landing sites, (2) Ranger 7, 8, and 9 impact sites, and (3) the Surveyor 1, 3, 5, and 7 landing sites. These data were then compared with photographic data. Surveyor 6 was excluded because it landed near the center of the lunar disk where echo data are poor. Three problems concerning the echo data are (1) the frequency distributions of echo strengths from site to site, (2) the areal distribution of echoes, and (3) detailed correlation of echoes with the photographs of the Apollo 17 landing area. Author

N74-18480* Geological Survey, Washington, D.C.
COMPARISON BETWEEN PHOTOGRAMMETRIC AND BISTATIC-RADAR SLOPE FREQUENCY DISTRIBUTIONS c07
H. J. Moore and G. L. Tyler (Stanford Univ.) *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 17I

A comparison was made of the results for lunar surface roughness estimates and slope frequency distributions obtained by using photogrammetric techniques with those obtained by using bistatic radar. Three topics were discussed: (1) the form of the slope frequency distributions, (2) the change of roughness estimates of the lunar surface with scale, and (3) the magnitude of surface roughness. Author

N74-18481* Geological Survey, Washington, D.C.
EFFECT OF PHOTOGRAMMETRIC READING ERROR ON SLOPE-FREQUENCY DISTRIBUTIONS c14
H. J. Moore and Sherman S. C. Wu *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 9 p refs (For availability see N74-18428 09-30)
CSCL 14E

The effect of reading error on two hypothetical slope frequency distributions and two slope frequency distributions from actual lunar data in order to ensure that these errors do not cause excessive overestimates of algebraic standard deviations for the slope frequency distributions. The errors introduced are insignificant when the reading error is small and the slope length is large. A method for correcting the errors in slope frequency distributions is presented and applied to 11 distributions obtained from Apollo 15, 16, and 17 panoramic camera photographs and Apollo 16 metric camera photographs. Author

N74-18482* Geological Survey, Washington, D.C.
REPEATABILITY OF ELEVATION MEASUREMENTS: APOLLO PHOTOGRAPHY c14
Sherman S. C. Wu, Francis J. Schafer, Gray M. Nakata, and Raymond Jordon *In* NASA. Johnson Space Center Apollo 17 Prelim. Sci. Rept. 1973 6 p refs (For availability see N74-18428 09-30)
CSCL 14E

Sun elevation angle effects on repeatability, using Apollo 15 photographs are analyzed and results extended to slope related effects. Preliminary results indicate repeatibility of elevation measurement is related to contrast in the stereoscopic image. E.H.W.

N74-18483* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO 17 LASER ALTIMETER c14
W. R. Wollenhaupt, W. L. Sjogren (JPL), R. E. Lingenfelter (Calif. Univ., Los Angeles), G. Schubert (Calif. Univ., Los Angeles), and W. M. Kaula (Calif. Univ., Los Angeles) *In its* Apollo 17 Prelim. Sci. Rept. 1973 4 p refs (For availability see N74-18428 09-30)
CSCL 14B

The performance and operation of the Apollo 17 laser altimeter after several modifications are discussed. Functions of the instrument include precise altitude measurement of the CSM above the lunar surface, and measurement of broad scale topographic relief around the entire circumference of the moon. E.H.W.

N74-18484* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ZODIACAL LIGHT PHOTOGRAPHY c14
R. D. Mercer (Didlye Obs.), L. Dunkelman, and R. E. Evans *In its* Apollo 17 Prelim. Sci. Rept. 1973 3 p refs (For availability see N74-18428 09-30)
CSCL 14E

Polarized and red- and blue-filter photographs of zodiacal light obtained by Apollo 17 are analyzed. Attempts were made to identify the cause of subtle change in the observed light and determine the dust composition of the light. A comparison of red and blue images indicates such changes may be caused by particle size distribution and range, number of particles along any given line of sight, particle surface characteristics including dielectric compared to metallic properties, and variations of the parameters as a function of distance from the sun. E.H.W.

N74-18485* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOLAR CORONA PHOTOGRAPHY c14
R. M. MacQueen, C. L. Ross, and R. E. Evans *In its* Apollo 17 Prelim. Sci. Rept. 1973 3 p refs (For availability see N74-18428 09-30)
CSCL 14E

An analysis was made of Apollo 17 solar corona photographs in an effort to identify coronal streamers observed from earth. The photographs corroborate earth based observations; moreover, visual observations made by the Apollo crew indicate clearly identifiable streamers which extend to approximately 100 solar radii. E.H.W.

N74-18486*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LAGEOS MISSION ANALYSES Interim Report
R. K. Squires and J. L. Cooley Dec. 1973 54 p refs (NASA-TM-X-70598; X-591-74-25) Avail: NTIS HC $5.75
CSCL 22C

Two error sources are found to be compatible and significant for the parameters affecting the LAGEOS mission. The first error source is the uncertainty in the gravity model, and the second error source is the radiation pressure which includes direct radiation, albedo radiation, and earth shine. Retrograde orbits increase the number of passes per day over the tracking stations at the expense of also increasing the number of time gaps when no station is observing. It is shown that relativistic effects are significant and must be included in orbit computation and determination systems for this mission. If station locations are known only to one meter, the error in the satellite orbits is comparable with solar pressure induced errors. Author

N74-18487*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY STREAM INTERFACES
Leonard F. Burlaga Feb. 1974 33 p refs (NASA-TM-X-70601; X-692-74-46) Avail: NTIS HC $4.75
CSCL 03B

At 1 AU there is a distinct boundary (the stream interface) at the leading edge of a stream in the solar wind, characterized by an abrupt drop in density, a similar increase in temperature and a small increase in speed. It is suggested that stream interfaces form in the interplanetary medium as a consequence of the non-linear evolution of streams generated by an increase in temperature in the solar envelope. This evolution eventually leads to the formation of a reverse shock behind the interface and a forward shock ahead of it. Two instances in which both a stream interface and a reverse shock had developed at 1 AU are presented. Examples of flare generated shocks which passed through a stream and were observed near a stream interface are also

presented. It is shown that stream interfaces are definitely not the same structures as piston boundaries. It is noted that slow shocks, like stream interfaces, always occur ahead of streams and may develop in the interplanetary medium. Author

N74-18488*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE OCTOBER 1973 SPACE SHUTTLE TRAFFIC MODEL, REVISION 2
Jan. 1974 208 p Revised
(NASA-TM-X-64751) Avail: NTIS HC $13.50 CSCL 22A

Traffic model data for the space shuttle for calendar years 1980 through 1991 are presented along with some supporting and summary data. This model was developed from the 1973 NASA Payload Model, dated October 1973, and the NASA estimate of the 1973 Non-NASA/Non-DoD Payload Model. The estimates for the DoD flights included are based on the 1971 DoD Mission Model. Author

N74-18489*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE OCTOBER 1973 EXPENDABLE LAUNCH VEHICLE TRAFFIC MODEL, REVISION 2
Jan. 1974 95 p Revised
(NASA-TM-X-64752) Avail: NTIS HC $7.75 CSCL 22A

Traffic model data for current expendable launch vehicles (assuming no space shuttle) for calendar years 1980 through 1991 are presented along with some supporting and summary data. This model was based on a payload program equivalent in scientific return to the October 1973 NASA Payload Model, the NASA estimated non NASA/non DoD Payload Model, and the 1971 DoD Mission Model. Author

N74-18490*# Linguistic Systems, Inc., Cambridge, Mass.
AN INTERPRETATION OF THE DISTRIBUTION OF CRATERS IN THE VISIBLE PORTION OF THE LUNAR SURFACE
L. V. Leontyev Washington NASA Mar. 1974 20 p refs Transl. into ENGLISH of "Intepretatsiya Raspredeleniya Kraterov na Vidimoy Chasti Lunnoy Poverkhnosti", Acad. of Sci., Inst. of Space Res., Moscow, report D-153, 1973 19 p
(Contract NASw-2482)
(NASA-TT-F-15289; D-153) Avail: NTIS HC $4.00 CSCL 03B

A relationship is established according to the results of high-speed collisions between the dimensions of the lunar craters and the masses of the meteoric bodies that formed them. The data obtained are useful for estimating the meteoric showers bombarding the visible part of the moon's surface, and in analyzing the arrangement of craters in this region. It is determined that the fundamental stream is characterized by a distribution of the bodies according to mass, similar to the distribution of the bodies in a present-day sporadic meteor stream, and an empirical relationship of the change in this stream's intensity according to time is obtained. Author

N74-18491*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT (CPLEE) Final Technical Report
David L. Reasoner 28 Feb. 1974 110 p refs
(Contract NAS9-5884)
(NASA-CR-134205) Avail: NTIS HC $8.50

Research development in the Charged Particle Lunar Environment Experiment (CPLEE) is reported. The CPLEE is ion-electron spectrometer placed on the lunar surface for the purpose of measuring charged particle fluxes impacting the moon from a variety of regions and to study the interactions between space plasmas and the lunar surface. The principal accomplishments reported include: (1) furnishing design specifications for construction of the CPLEE instruments; (2) development of an advanced computer-controlled facility for automated instrument calibration; (3) active participation in the deployment and past-deployment operational phases with regard to data verification and operational mode selection; and (4) publication of research papers, including a study of lunar photoelectrons, a study of plasmas resulting from man-made lunar impart events, a study of magnetotail and magnetosheath particle populations, and a study of solar-flare interplanetary particles. Author

N74-18492*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE MENDELEEV CRATER CHAIN: A DESCRIPTION AND DISCUSSION OF ORIGIN
Dean Eppler (Lockheed Electronics Co., Inc., Houston, Tex.) and Grant Heiken Feb. 1974 12 p refs
(NASA-TM-X-58108; JSC-08559) Avail: NTIS HC $4.00 CSCL 03B

A 113-kilometer-long crater chain on the floor of Mendeleev Crater is the best morphological example of several similar chains on the lunar far side. Age relationships relative to Mendeleev Crater indicate that it is a younger feature that may have developed over a fault parallel to the lunar grid system. The dumbbell shape of the chain may be related to a differential stress along a fault crossing the floor that resulted in varying resistance to magma invasion. Author

N74-18493# Kodaikanal Observatory (India).
[SOLAR AND STELLAR PHYSICS DATA FROM KODAIKANAL OBSERVATORY] Annual Report, 1969
1972 11 p
Avail: NTIS HC $4.00

Improvements to the solar magnetometer are reported along with studies of solar wind characteristics based on the sodium emission in cometary nuclei, and the velocity field structure in a super-granule. The spectra of several stars, and developments in radio astronomy are discussed. Solar activity data for 1969 are included. F.O.S.

N74-18494# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE NO. 318
11 Feb. 1974 61 p Transl. into ENGLISH from various Soviet bloc periodicals
(JPRS-61196) Avail: NTIS HC $6.25

Translations and abstracts are reported of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports. Author

N74-18495# Calgary Univ. (Alberta). Dept. of Physics.
A NEW OBSERVATORY IN WESTERN CANADA: THE ROTHNEY ASTROPHYSICAL OBSERVATORY OF THE UNIVERSITY OF CALGARY
T. A. Clark, E. F. Milone, S. R. Sreenivasan, and D. Venkatesan 1972 5 p
(Rept-1) Avail: NTIS HC $4.00

The proposed use of the Rothney Astrophysical Observatory as a training facility for astrophysics and astronomy students is reported. Research in optical and infrared photometry was also proposed. E.H.W.

N74-18496# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF PERSONAL ERRORS IN OBSERVATIONS OF THE LARGE PLANETS
G. M. Petrov, V. N. Pyshnenko, and R. T. Fedorova 5 Feb. 1974 10 p Transl. into ENGLISH from Izv. Gl. Astron. Observ. v Pulkove (Leningrad), no. 191, 1973 p 107-111
(JPRS-61147) Avail: NTIS HC $4.00

A description is given of an instrument for determining and studying the personal errors in observation of the large planets. Allowance for the determined corrections made it possible to improve the agreement of the observed right ascensions of the planets and data given in the ephemerides. Author

N74-18497*# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
AIRBORNE OBSERVATIONS OF METHANE IN COMET KOHOUTEK Final Report
A. E. Roche and W. C. Wells Feb. 1974 11 p
(Contract NAS2-7991)
(NASA-CR-114738; LMSC-D358455) Avail: NTIS HC $4.00 CSCL 03B

The experiment is described for airborne observations of Comet Kohoutek using an infrared tilting-filter photometer. Preliminary analysis of the data established an upper limit to the Comet's fluorescence radiation in methane lines at 3.3 microns. F.O.S.

N74-18498*# National Aeronautics and Space Administration, Washington, D.C.
SALYUT SPACE STATION IN ORBIT
M. P. Vasilyev, ed., K. D. Bushuyev, ed., O. G. Gazenko, ed., A. S. Yeliseyev, ed., G. I. Petrov, ed., V. A. Shatalov, ed., and V. A. Patsayev, comp. Mar. 1974 149 p Transl. into ENGLISH of the book "Salyut na Orbite" Moscow, Mashinostr. Press, 1973 160 p
(NASA-TT-F-15450) Avail: NTIS HC $10.50 CSCL 22C

Data from the scientific work of the crew of the first Salyut long-term orbital scientific station are presented. The structural features and the scientific equipment of the Salyut station are described. Broad information and flight documents of the station and excerpts from the logs and notebooks of the cosmonauts, and fragments of their radio conversations with the flight control center are presented. The data from the scientific research and experiments performed onboard the station are generalized. Photographs taken from onboard the station, frames from onboard movies, diagrams, and color photographs are included. Author

N74-18499# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany). Inst. fuer Stratosphaerenphysik.
TEMPERATURE CALCULATION OF THE VENUS ATMOSPHERE UP TO 80 km HEIGHT BASED ON SOLAR AND THERMAL HEAT FLOW AND CONVECTIVE AND TURBULENT HEAT TRANSFER [TEMPERATURBERECHNUNG DER VENUSATMOSPHAERE BIS 80 km HOEHE AUF GRUND SOLARER UND THERMISCHER STRAHLUNGSSTROEME SOWIE KONVEKTIVER UND TURBULENTER WAERMETRANSPORTE]
Erich Roeckner Springer Verlag 1972 59 p refs In GERMAN; ENGLISH summary
(Rept-46/1972) Avail: NTIS HC $6.00

Vertical temperature profiles of the Venus atmosphere up to 80 km height were calculated in a time dependent model. A steady state of the atmospheric profiles was reached by numerical integration from an arbitrary initial distribution of temperature by assuming some atmospheric parameters as surface pressure, planetary albdeo, etc. The time-rate-of-change of temperature was determined by the vertical divergence of the following fluxes: solar insolation, net infrared radiation of the atmosphere and the ground surface, and sensible heat. The radiation calculation was based on the absorption bands of carbon dioxide and water vapor from the near to the far infrared region of the spectrum. Absorption by clouds was taken into account in parameterized form. Atmospheric profiles were calculated as a function of water vapor content, height and absorptivity of the cloud layer, surface pressure, eddy diffusion coefficient, planetary albdeo, latitude, and time of day. It appeared that the lower layers of a pure carbon dioxide atmosphere are convective with an adiabatic lapse rate of temperature. The lapse rate of a carbon dioxide atmosphere with some additional water vapor and thus strong absorption of solar energy is practically adiabatic due to the downward transport of sensible heat. Author (ESRO)

N74-18500# Aerospace Corp., El Segundo, Calif. Lab Operations.
ASTRONOMY RESEARCH AT THE AEROSPACE CORPORATION, 1973
George A. Paulikas 30 Nov. 1973 29 p
(Contract F04701-73-C-0074)
(AD-770986; TR-0074(4260-01)-2, SAMSO-TR-73-383) Avail: NTIS CSCL 03/2

The report reviews the astronomy research carried out at the Aerospace Corporation during 1973. The report describes the activities of the San Fernando Observatory, the research in millimeter wave radio astronomy as well as the space astronomy research. Author (GRA)

N74-18501# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 317
30 Jan. 1974 126 p refs Transl. into ENGLISH from Russian reports
(JPRS-61107) Avail: NTIS

Translations and abstracts are presented for articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports. Published details of Soviet space spectaculars are included. Author

N74-18502# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ASTRONAUTICS AND APPLIED SCIENTIFIC PROGRESS
M. Keldysh 10 Dec. 1973 11 p
(AD-772005; FTD-HT-23-729-74) Avail: NTIS CSCL 22/1

The report describes in generalities the effects of space research on science and technology. GRA

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N74-18503*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF INVESTIGATIONS (OA20A) ON A 0.015-SCALE 140A/B CONFIGURATION SPACE SHUTTLE VEHICLE ORBITER MODEL IN THE NASA/LANGLEY RESEARCH CENTER UNITARY PLAN WIND TUNNEL
M. E. Nichols (Rockwell International, Downey, Calif.) Feb. 1974 175 p
(Contract NAS9-13247)
(NASA-CR-134081; DMS-DR-2083) Avail: NTIS HC $11.75 CSCL 22B

Data obtained from a wind tunnel test of a 0.015-scale 140A/B configuration SSV orbiter model are presented. This test was conducted with runs at Mach numbers of 2.5, 3.9, and 4.6 for a constant Reynolds number of 2.5 x 1,000,000/foot. Only one model configuration, the complete 140A/B orbiter vehicle, was investigated; various control-surface settings were run through angles-of-attack from -4 to +42 degrees at 0 and +3 degrees of yaw and through angles-of-sideslip from -4 to +6 degrees at 0, +10, +20, and +30 degrees pitch. The purpose of this test was to establish and verify longitudinal and lateral-directional stability and control characteristics for the updated SSV configuration. Author

N74-18504*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF LOW SPEED WIND TUNNEL TESTS ON A .0405 SCALE MODEL ROCKWELL SPACE SHUTTLE ORBITER TESTED BOTH IN FREE AIR AND IN THE PRESENCE OF A GROUND PLANE (OA16)
Robert C. Mennell (Rockwell Intern., Los Angeles) and Bruce Cameron (Rockwell Intern., Los Angeles) Jan. 1974 858 p
(Contract NAS9-13247)
(NASA-CR-128793; DMS-DR-2038) Avail: NTIS HC $46.00 CSCL 22B

Experimental aerodynamic investigations were conducted on a .0405 scale representation of the space shuttle orbiter in a 7.75 x 11 foot low speed wind tunnel during the time period March 21, to April 17, 1973. The primary test objectives were to investigate both the aerodynamic and propulsion effects of various air breathing engine systems in free air and in the presence of the ground. The free air portion of this test investigated the aerodynamic effects of engine nacelle number, nacelle grouping, and nacelle location. For this testing the model was sting mounted on a six component internal strain gage balance entering through the model base. The ground plane portion of the aerodynamic test investigated the same nacelle effects at ground plane locations of full scale W.P. = 239.9, 209.3, 158.9, 108.5, and 7.78 in. At the conclusion of the aerodynamic test period the propulsion effects of various nacelle locations and freestream orientations in the presence of the ground were investigated. Author

N74-18505*# Martin Marietta Corp., Denver, Colo.
VACUUM JACKETED COMPOSITE PROPULSION FEED-LINES FOR CRYOGENIC LAUNCH AND SPACE VEHICLES, VOLUME 1 Final Report, Jun. 1972 - Aug. 1973
D. E. Spond, D. J. Laintz, C. A. Hall, and D. E. Dulaigh Mar. 1974 139 p refs
(Contract NAS3-16762)
(NASA-CR-134550) Avail: NTIS HC $10.00 CSCL 22B

Thin metallic liners that provide leak-free service in cryogenic propulsion systems are overwrapped with a glass-fiber composite that provides strength and protection from handling damage. The resultant tube is lightweight, strong, and has a low thermal flux. The inside commodity flow line and the outside vacuum jacket were fabricated using this method. Several types of vacuum jackets were fabricated and tested at operating temperatures from 294 to 21 K (+70 to minus 423 F) and operating pressure up to 69 N/cm2 (100 psi). The primary objective of the program was to develop vacuum jacket concepts, using previously developed concepts for the inner line. All major program objectives were met resulting in a design concept that is adaptable to a wide range of aerospace vehicle requirements. Major items of development included convolution of thin metallic sections up to 46 cm (18 in.) in diameter, design and fabrication of an extremely lightweight tension membrane concept for the vacuum jacket, and analytical tools that predict the failure mode and levels. Author

N74-18506*# Martin Marietta Corp., Denver, Colo.
VACUUM JACKETED COMPOSITE PROPULSION FEED-LINES FOR CRYOGENIC LAUNCH AND SPACE VEHICLES. VOLUME 2: APPENDIXES Final Report
D. E. Spond, D. J. Laintz, C. A. Hall, and D. E. Dulaigh Mar. 1974 145 p refs
(Contract NAS3-16762)
(NASA-CR-134554) Avail: NTIS HC $10.25 CSCL 22B
For abstract, see N74-18505.

N74-18507*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE SHUTTLE HEAT PIPE THERMAL CONTROL SYSTEMS Final Report, Jun. 1972 - Oct. 1973
J. Alario Oct. 1973 184 p refs
(Contract NAS9-12801)
(NASA-CR-134201; SHM-20) Avail: NTIS HC $12.25 CSCL 22B

Heat pipe (HP) thermal control systems designed for possible space shuttle applications were built and tested under this program. They are: (1) a HP augmented cold rail, (2) a HP/phase change material (PCM) modular heat sink and (3) a HP radiating panel for compartment temperature control. The HP augmented cold rail is similar to a standard two-passage fluid cold rail except that it contains an integral, centrally located HP throughout its length. The central HP core helps to increase the local power density capability by spreading concentrated heat inputs over the entire rail. The HP/PCM modular heat sink system consists of a diode HP connected in series to a standard HP that has a PCM canister attached to its mid-section. It is designed to connect a heat source to a structural heat sink during normal operation, and to automatically decouple from it and sink to the PCM whenever structural temperatures are too high. The HP radiating panel is designed to conductively couple the panel feeder HPs directly to a fluid line that serves as a source of waste heat. It is a simple strap-on type of system that requires no internal or external line modifications to distribute the heat to a large radiating area. Author

N74-18508*# Chrysler Corp., New Orleans, La. Space Div.
EFFECT OF REACTION CONTROL SYSTEM JET-FLOW FIELD INTERACTIONS ON A 0.015 SCALE MODEL SPACE SHUTTLE ORBITER AERODYNAMIC CHARACTERISTICS
William J. Monta (NASA, Langley Res. Center, Va.) and J. R. Rausch (Gen. Dyn/Convair, San Diego) Nov. 1973 425 p refs
(Contract NAS9-13247)
(NASA-CR-134074; DMS-DR-2069) Avail: NTIS HC $24.25 CSCL 22B

The effects of the reaction control system (RCS) jet-flow field interactions on the space shuttle orbiter system during entry are discussed. The primary objective of the test program was to obtain data for the shuttle orbiter configuration to determine control amplification factors resulting from jet interaction between the RCS plumes and the external flow over the vehicle. A secondary objective was to provide data for comparison and improvement of analytic jet interaction prediction techniques. The test program was divided into two phases; (1) force and moment measurements were made with and without RCS blowing, investigating environment parameters (R sub e, Alpha, Beta), RCS plume parameters (Jet pressure ratio, momentum ratio and thrust level), and geometry parameters (RCS pod locations) on the orbiter model, (2) oil flow visualization tests were conducted on a dummy balance at the end of the test. Author

N74-18509*# Chrysler Corp., New Orleans, La. Data Management Services.
EFFECTS OF THE SIX ENGINE AIR BREATHING PROPULSION SYSTEM ON SPACE SHUTTLE ORBITER SUBSONIC STABILITY AND CONTROL CHARACTERISTICS Space Shuttle
R. C. Mennell (Rockwell Intern., Los Angeles) and T. Soard (Rockwell Intern., Los Angeles) Jan. 1974 447 p
(Contract NAS9-13247)
(NASA-CR-134078; DMS-DR-2086) Avail: NTIS HC $25.50 CSCL 22B

Experimental aerodynamic investigations were conducted on a 0.0405 scale representation of the -89B space shuttle orbiter in the 7.75 x 11.00 foot low speed wind tunnel during the time period September 4 - 14, 1973. The primary test objective was to optimize the air breathing propulsion system nacelle cowl-inlet design and to determine the aerodynamic effects of this design on the orbiter stability and control characteristics. Nacelle cowl-inlet optimization was determined from total pressure - static pressure measurements obtained from pressure rakes located in the left hand nacelle pod at the engine face station. After the optimum cow-inlet design, consisting of a 7 deg cowl lip angle, short cowl, 7 deg short diverter, and a nacelle toe-in angle of 5 deg was selected, the aerodynamic effects of various locations of this design were investigated. The 3 pod - 6 Nacelle configuration was tested both underwing and overwing in three different longitudinal locations. Orbiter control effectiveness, both with and without Nacelles, was investigated at elevon deflections of 0 deg, -10 deg and +15 deg and at aileron deflections of 0 deg and +10 deg about 0 deg elevon. Author

N74-18510*# Chrysler Corp., New Orleans, La. Space Div.
EFFECT OF GASEOUS AND SOLID SIMULATED JET PLUMES ON A 040A SPACE SHUTTLE LAUNCH CONFIGURATION AT MACH NUMBERS FROM 1.6 TO 2.2
M. J. Lanfranco, V. W. Sparks, and Alan T. Kavanaugh Dec. 1973 324 p refs
(Contract NAS9-13247)
(NASA-CR-128762; DMS-DR-2013) Avail: NTIS HC $19.25 CSCL 22B

An experimental investigation was conducted in a 9- by 7-foot supersonic wind tunnel to determine the effect of plume-induced flow separation and aspiration effects due to operation of both the orbiter and the solid rocket motors on a 0.019-scale model of the launch configuration of the space shuttle vehicle. Longitudinal and lateral-directional stability data were obtained at Mach numbers of 1.6, 2.0, and 2.2 with and without the engines operating. The plumes exiting from the engines were simulated by a cold gas jet supplied by an auxiliary 200 atmosphere air supply system, and by solid body plume simulators. Comparisons of the aerodynamic effects produced by these two simulation procedures are presented. The data indicate that the parameters most significantly affected by the jet plumes are the pitching moment, the elevon control effectiveness, the axial force, and the orbiter wing loads. Author

N74-18511*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: DEVELOPMENT FLIGHT INSTRUMENTATION
Norman B. Farmer Washington Mar. 1974 50 p
(NASA-TN-D-7598; JSC-S-387) Avail: NTIS HC $3.25 CSCL 22B

Development flight instrumentation was delivered for 25 Apollo vehicles as Government-furnished equipment. The problems

and philosophies of an activity that was concerned with supplying telemetry equipment to a space-flight test program are discussed. Equipment delivery dates, system-design details, and flight-performance information for each mission also are included.
Author

N74-18512*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB PHASE B STUDY ENVIRONMENTAL CONTROL SYSTEM COMPONENT HANDBOOK
R. A. Burns and A. J. Ignatonis Mar. 1974 91 p
(NASA-TM-X-64827) Avail: NTIS HC $7.75 CSCL 22B

Descriptions are given of candidate components for the Phase B Study of the Spacelab environmental control system. Most of the hardware was defined for the baseline ECS design concept. A low cost design approach was followed, with most of the components being selected from the Apollo and Skylab Programs.
Author

N74-18513# Lockheed Missiles and Space Co., Palo Alto, Calif.
INVESTIGATION OF THE DYNAMICS OF DISCRETE MISSILE CONTROL SYSTEMS BY USING LOGARITHMIC FREQUENCY CHARACTERISTICS. CHAPTER 5
V. D. Arens, S. M. Fedorov, M. S. Khitrik, and S. V. Luchko [1973] 39 p Transl. into ENGLISH from the book "Dinamika Sistem Upravleniia Raket s Bortovoi Tsifrovymi Vychislitelnymi Mashinami" Moscow, Mashinostroenie, 1972 p 128-179
Avail: NTIS HC $5.00; National Translations Center; John Crerar Library, Chicago, Ill. 60616

The dynamics of discrete missile stabilization systems was investigated in several stages. The investigation was first conducted for the most simplified dynamical systems, taking into account only the fundamental missile motion. Other factors affecting the stabilization process were also taken into account.
Author

N74-18514# Royal Aircraft Establishment, Farnborough (England).
AIR DENSITY AT HEIGHTS NEAR 200 km FROM THE ORBIT OF 1970-65D
Doreen M. C. Walker Aug. 1973 22 p refs
(RAE-TR-73098; BR36510) Avail: NTIS HC $4.25

Cosmos 359 rocket, 1970-65D, entered orbit on 22 August 1970, with an initial perigee height of 209 km and inclination 51.2 deg and decayed on 6 October 1971. Accurate orbits were computed from all available observations, orbits being determined at 42 epochs from 2600 observations. Using the values of perigee height from the orbits and decay rates from USAF Spacetrack bulletins, 146 values of air density were calculated between August 1970 and September 1971, mainly at heights between 180 and 230 km. On ten occasions in 1971 when there were substantial geomagnetic disturbances, there were sudden increases in density, the largest being about 32%. When the density was corrected to a fixed height and allowance was made for the day-to-night variation and the effects of solar activity, the dominant feature was a semi-annual variation, with maxima in density centered at 6 November 1970 and 7 April 1971, and minima centered at 5 January and 28 July 1971. The maxima in density are nearly equal and exceed the minima by about 50%.
Author (ESRO)

N74-18515# Christian Rovsing Ltd., Copenhagen (Denmark).
EVALUATION OF HEOS 2 ATTITUDE RESULTS
Lars Peter Johansson Sep. 1973 75 p refs
(Contract ESOC-498/72-AR)
(ESRO-CR(P)-346) Avail: NTIS HC $6.75

Methods for determination of the attitude of spin stabilized satellites, using earth albedo and sun measurements, were studied. The Derksen method, involving least squares estimation of the spin axis vector by use of an iterative technique, is the most accurate and reliable one. It requires a reasonably good a priori estimate of the spin axis vector. The massart method, a least squares estimation of the spin axis vector, using the Lagrange multipliers technique, might produce wrong solutions when data from only one albedo sensor slit is used. The method would be just as accurate and reliable as the Derksen method if data from two slit planes were used. Using the averaged sun angle, the Endl method might cause difficulties in computing the spin axis from a single measurement.
Author (ESRO)

N74-18516# Software und Engineering fuer Daten Verarbeiungs und Automationssysteme, Frankfurt am Main (West Germany).
STUDY OF INTEGRATED PERFORMANCE EVALUATION SYSTEM Final Report
W. Nagl and K. Stehling 13 Jun. 1973 131 p refs
(Contract ESOC-456/72-AR)
(ST/F/P-3141; ESRO-CR(P)-347) Avail: NTIS HC $9.75

An integrated performance evaluation system for geostationary satellites, comprising real time and long term evaluation, and spacecraft, network and station data considerations, is discussed. The system consists of three main parts: a spacecraft dedicated basic real time evaluation system with capabilities for fixed limit checking, limited closed loop control, and limited reporting and stripcharting capabilities; a spacecraft dedicated extended real time evaluation system with lower implementation priority, checking the spacecraft's behavior by comparison with a nominal spacecraft state produced by a simulation package; a medium and long term evaluation system based upon the Spesys Data Processing and Presentation System already used at ESOC for spacecraft performance evaluation.
ESRO

N74-18517# British Aircraft Corp. (Operating) Ltd., Bristol (England). Guided Weapons Technical Publications Dept.
SATELLITE OPERATIONS MODEL. GENERAL MODEL FEASIBILITY STUDY Final Report
A. H. Nimmo, comp. Jan. 1973 84 p refs
(Contract ESOC-385/71-AR)
(ESS/SS-438; ESRO-CR(P)-348) Avail: NTIS HC $7.25

A digital mathematical model representing spacecraft operations and presenting operational data to the spacecraft team for analysis was developed. The study was carried out in two phases; development of a digital model of the HEOS-A2 spacecraft, including attitude control and measurement subsystems, power supply and experiment payload, thermal control subsystem and telemetry and telecommand functions; feasibility for a general digital spacecraft model, considering COS-B in particular and the extension of the open loop model to closed loop programs.
ESRO

N74-18518# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ARTIFICIAL EARTH SATELLITE. 2. THE METHODS OF PRECISE OBSERVATIONS OF ISZ
9 Nov. 1973 10 p Transl. into ENGLISH from the book "Issled. Kosmich. Prostraustva" USSR, 1970 p 20-24
(AD-771620; FTD-MT-24-706-74) Avail: NTIS CSCL 22/4

The report describes various tracking and non-tracking cameras used by countries involved in satellite observations.
GRA

N74-18519# Vehicle Research Corp., San Gabriel, Calif.
HIGH PERFORMANCE HOLLOW PROJECTILES Final Technical Report
Scott Rethorst, Tooshio Fujita, J. J. Wu, E. R. Sargent, and Robert Berlot 17 Aug. 1973 84 p refs
(Contract DAAD05-72-C-0296; ARPA Order 1575)
(AD-768907; VRC-26) Avail: NTIS CSCL 19/1

The present effort has established a basic theoretical and experimental foundation which is broadly applicable to the entire size spectrum of hollow projectile ammunition. For initial demonstration purposes, simple base plug sabots were employed to fire 7.62 mm projectiles. Exploratory investigations of compact arrangements (e.g., puller sabots allowing propellant to be packaged inside the hollow projectile) suitable for practical small arms ammunition yielded promising results regarding further development. Additionally, simple and inexpensive methods of imparting spin for stabilization were developed. The projectiles were coated with a thin outer layer of soft metals and soft plastics which engaged the rifling. This greatly simplifies sabot design and will significantly contribute to the ultimate goal of developing practical ammunition systems. The coating development was conducted to the point of demonstrating basic feasibility.
Author

N74-18520# Naval Weapons Lab., Dahlgren, Va.
A FLOW VISUALIZATION STUDY OF FREE ROLLING CRUCIFORM FINS IN CROSS FLOW
P. Daniels Nov. 1973 12 p refs
(AD-771035; NWL-TR-3053) Avail: NTIS CSCL 16/3

A smoke flow visualization study was conducted at subsonic speeds which showed that roll speed-up can be produced by vortices shed from fins alone. This vortex shedding is displayed at large and small roll rates. Author (GRA)

N74-18521# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WE HAVE LINK-UP
M. Kashevnik and O. Losoto 30 Nov. 1973 10 p refs Transl. into ENGLISH from Leninskoe Zhamya (USSR), no. 181, 4 Aug. 1973
(AD-772054; FTD-HT-23-731-74) Avail: NTIS CSCL 22/1

The report describes a Soviet spacecraft docking simulator that will eventually be designed to adapt to an Apollo vehicle. GRA

N74-18522# United Aircraft Corp., East Hartford, Conn. Research Labs.
SYNTHESIS OF RAMJET MISSILE INTEGRATED FLIGHT CONTROL/FUEL CONTROL Final Technical Report, 20 Oct. 1972 - 19 Oct. 1973
Gerald J. Michael and Robert C. DiPietro Nov. 1973 66 p refs
(Contract N00019-73-C-0131)
(AD-772112; UARL-M941526-4) Avail: NTIS CSCL 16/4

An analytical study and computer simulation were conducted to investigate integrated flight control/fuel control systems for controlling the longitudinal-plane flight path and dynamics of a ramjet missile. The hypothetical mission and control objectives chosen for the missile were assumed to be representative of fleet air defense tasks. It was assumed that the missile would be launched from an aircraft at supersonic speeds and would be commanded to accelerate and climb to intercept altitude. The flight envelope encompassed altitudes from 20,000 to 80,000 ft and Mach numbers from 2.0 to 4.0. (Modified author abstract) GRA

N74-18569 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF VENUS WITH INTERPLANETARY STATIONS
N. F. Borodin and V. I. Osmakov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 8-14 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 8-12 (For availability see N74-18567 09-34)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-18523*# Howard, Needles, Tammen and Bergendoff, Alexandria, Va. Dept. of Mechanical Engineering.
THE THREE DIMENSIONAL MOTION AND STABILITY OF A ROTATING SPACE STATION-CABLE - COUNTERWEIGHT CONFIGURATION Semiannual Status Report, 16 Jun. - 15 Dec. 1973
Peter M. Bainum 18 Dec. 1973 17 p refs
(Grant NGR-09-011-053)
(NASA-CR-137146) Avail: NTIS HC $4.00 CSCL 20K

The three dimensional equations of motion for a cable connected space station - counterweight system are developed using a Lagrangian formulation. The system model employed allows for cable and end body damping and restoring effects. The equations are then linearized about the equilibrium motion and nondimensionalized. To first degree, the out-of-plane equations uncouple from the in-plane equations. Therefore, the characteristic polynomials for the in-plane and out-of-plane equations are developed and treated separately. From the general in-plane characteristic equation, necessary conditions for stability are obtained. The Routh-Hurwitz necessary and sufficient conditions for stability are derived for the general out-of-plane characteristic equation. Special cases of the in-plane and out-of-plane equations (such as identical end masses, and when the cable is attached to the centers of mass of the two end bodies) are then examined for stability criteria. Author

N74-18524*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORTRAN 4 PROGRAMS FOR SUMMARIZATION AND ANALYSIS OF FRACTURE TRACE AND LINEAMENT PATTERNS
Melvin H. Podwysocki and Paul D. Lowman, Jr. Jan. 1974 50 p refs Prepared in cooperation with Maryland Univ., College Park
(Grant NGR-21-002-368)
(NASA-TM-X-70596; X-644-74-3) Avail: NTIS HC $5.50 CSCL 20K

Systematic and detailed analysis of lineament and fracture trace patterns has long been neglected because of the large number of observations involved in such an analysis. Three FORTRAN 4 programs were written to facilitate this manipulation. TRANSFORM converts the initial fracture map data into a format compatible with AZMAP, whose options allow repetitive manipulation of the data for optimization of the analysis. ROSE creates rose diagrams of the fracture patterns suitable for map overlays and tectonic interpretation. Examples are given and further analysis techniques using output from these programs are discussed. Author

N74-18525*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLUTTER OF PANELS ON DISCRETE FLEXIBLE SUPPORTS
Manuel Stein Washington Mar. 1974 24 p refs
(NASA-TN-D-7443; L-9205) Avail: NTIS HC $3.00 CSCL 20K

The supersonic flutter of wide panels on discrete flexible supports is investigated for three different panel-support configurations. The first study examines the effect of support stiffness on the flutter behavior of a specific five-support configuration with leading-and trailing-edge overhangs; this configuration was recently under consideration for a heat shield on an entry body. The second study investigates the effect of support stiffness on flutter of panels with various numbers of equally spaced supports. The third study examines the effect of center-support location on the flutter of panels with three supports. Results are presented in nondimensional form. The analysis is based on wide-plate structural theory and Ackeret aerodynamics. Finite differences are employed to obtain solutions for flutter pressure. A computer program based on this analysis and including a direct solution technique is presented. The program can be used to find the flutter pressure of wide panels of variable thickness supported by any number of flexible supports. Author

N74-18526# Cranfield Inst. of Technology (England).
ADDITIONAL DAMPING FOR TALL STRUCTURES
K. C. Johns Sep. 1973 43 p refs Sponsored by Sci. Res. Council
(Aero-19) Avail: NTIS HC $5.25

A study is made of a method of vibration reduction in tall civil engineering structures in which flexibility is introduced artificially, but with passive dampers to absorb energy during any motion which results. In particular, an examination is carried out of the effect of introducing an articulation part-way up a tall tower, with passive dampers and springs to restrict the rotation that results. The method involves assigning three degrees of freedom, and the use of Lagrangian equations of motion. Power spectral density concepts are exploited using wind turbulence as a stationary random forcing function. In-wind vibrations only are studied. The optimal spring-stiffness/damper combination is sought for two specific tower designs. Author

N74-18527*# Ampex Corp., Redwood City, Calif. Research and Advanced Technology Div.
FEASIBILITY STUDY IN THE APPLICATION OF OPTICAL

SIGNAL ANALYSIS TO NON-DESTRUCTIVE TESTING OF COMPLEX STRUCTURES
Bill Baker and Hugh Brown Mar. 1974 50 p refs
(Contract NAS1-11749)
(NASA-CR-132385; RR-73-14) Avail: NTIS HC $5.50 CSCL 20K

Advantages of the large time bandwidth product of optical processing are presented. Experiments were performed to study the feasibility of the use of optical spectral analysis for detection of flaws in structural elements excited by random noise. Photographic and electronic methods of comparison of complex spectra were developed. Limitations were explored, and suggestions for further work are offered. Author

N74-18528*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF THREE-POINT-BEND TEST FOR MATERIALS WITH UNEQUAL TENSION AND COMPRESSION PROPERTIES
Christos C. Chamis Washington Mar. 1974 35 p refs
(NASA-TN-D-7572; E-7544) Avail: NTIS HC $3.25 CSCL 20K

An analysis capability is described for the three-point-bend test applicable to materials of linear but unequal tensile and compressive stress-strain relations. The capability consists of numerous equations of simple form and their graphical representation. Procedures are described to examine the local stress concentrations and failure modes initiation. Examples are given to illustrate the usefulness and ease of application of the capability. Comparisons are made with materials which have equal tensile and compressive properties. The results indicate possible underestimates for flexural modulus or strength ranging from 25 to 50 percent greater than values predicted when accounting for unequal properties. The capability can also be used to reduce test data from three-point-bending tests, extract material properties useful in design from these test data, select test specimen dimensions, and size structural members. Author

N74-18529# Lockheed Missiles and Space Co., Palo Alto, Calif.
HYDROELASTIC VIBRATIONS OF BEAMS FLOATING ON AN INCOMPRESSIBLE FLUID SURFACE
D. M. Rostovtsev 1973 5 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 1, 1973 p 128-132
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Determining the free vibration modes and frequencies of a floating beam of elliptic cross-section on the basis of the combined solution of the equations of mechanical bending vibrations and the hydrodynamics equations is considered. The difference between the beam vibration modes in a fluid and in a vacuum is estimated. Author

N74-18530# Oak Ridge National Lab., Tenn.
PRESSURE VESSEL RELIABILITY AS A FUNCTION OF ALLOWABLE STRESS
H. G. Arnold 1972 27 p refs Presented at Winter Meeting of ASME, Detroit, 11 Nov. 1973 Sponsored by AEC
(Conf-731105-1) Avail: NTIS HC $3.50

The probability of failure corresponding to specified levels of allowable design stress was calculated for pressure vessels designed in accordance with the ASME Boiler and Pressure Vessel Code. The analysis was performed for maximum shear stress failure and for cyclic stress failure. The significance of such failure prediction is discussed and a rationale for selecting an allowable stress is presented. Examples are presented that demonstrate the estimation of vessel failure probability as a function of load variation, strength variation, and design safety factor. Author (NSA)

N74-18531# Sandia Labs., Albuquerque, N.Mex.
USERS MANUAL FOR EPAD1 AND EPAD2: COMPUTER PROGRAMS FOR STATIC ELASTOPLASTIC STRESS ANALYSIS
S. E. Benzley, S. N. Burchett, and Z. E. Beisinger Sep. 1973 53 p refs
(Contract AT(29-1)-789)
(SLA-73-866) Avail: NTIS HC $4.75

EPAD is a finite-element program for the static elastoplastic stress analysis of arbitrary bodies of revolution subjected to either symmetrical or unsymmetrical loadings. EPAD1 and EPAD2 incorporate the original version of EPAD with an automatic mesh generation program and an output plotting package. Author (NSA)

N74-18532# Sandia Labs., Albuquerque, N.Mex.
METHOD FOR MEASURING UNLOADING PATHS IN PARTIALLY COMPACTED STRAIN-RATE INSENSITIVE POROUS MATERIALS
B. M. Butcher, L. A. Kent, and L. M. Lee Oct. 1973 38 p refs
(Contract AT(29-1)-789)
(SLA-73-152) Avail: NTIS HC $4.00

An experimental method is described for measuring the unloading paths of strain-rate insensitive porous materials. The dynamic wave propagation condition of one-dimensional strain was approximated for these measurements by confining the samples in a hardened steel die. Unloading stress-volume paths were determined from sound-velocity measurements on the partially compacted samples at various stresses applied in the direction of wave propagation. Experimental results are presented for 2.16 g/cucm porous 2024 aluminum, 6.77 g/cucm porous copper, and 1.73 g/cucm CVD carbon felt. Author (NSA)

N74-18533# Sandia Labs., Albuquerque, N.Mex.
NONLINEAR VISCOELASTIC EQUATION OF STATE FOR USE IN STRESS PROPAGATION CALCULATIONS
R. J. Lawrence Sep. 1973 53 p refs
(Contract AT(29-1)-789)
(SLA-73-635) Avail: NTIS HC $4.75

A routine providing a complete equation of state and constitutive relation for a nonlinear viscoelastic material is presented. The routine is suitable for use in finite difference wave propagation calculations. Application of the model to stress wave attenuation in rate dependent materials is used as an illustrative example. FORTRAN listings and input instructions are also provided. Author

N74-18534# Explosives Research and Development Establishment, Waltham Abbey (England).
A FREQUENCY RESPONSE ANALYSIS SYSTEM FOR THE MEASUREMENT OF THE DYNAMIC MECHANICAL PROPERTIES OF NON-METALLIC MATERIALS
D. A. G. Eldridge and D. H. L. Mansell Mar. 1973 51 p refs
(ERDE-TR-129, BR36666) Avail: NTIS HC $5.75

A system was developed to investigate the low-strain behavior of polymeric solids, under conditions of cyclically varying stress and strain. The properties examined were the in-phase and quadrature components of complex modulus and the associated loss angle at various frequencies. The particular advantage of this system is its ability to perform both flexural and torsional testing over a wide spectrum of material stiffness. Only flexural testing is described. Torque motors were sinusoidally driven to impart a known couple to a bar specimen. Strain was determined as angular movement detected by rotary transducers attached to the motor shafts. The system is controlled by a digital transfer-function analyzer which provides excitation (stress) in the range 0.0001 to 450 Hz, relates stress to strain, and then displays strain in complex form. Modulus was calculated knowing specimen dimensions, stress and complex components of strain. Author (ESRO)

N74-18535# Testwell Ltd., Daventry (England).
AN INVESTIGATION OF THE FRETTING FATIGUE STRENGTH OF BS L65 ALUMIMIUM ALLOY UNDER SINUSOIDAL AND NARROW BAND RANDOM CYCLIC STRESSING
R. J. Ryman and A. J. Billingham Orpington, Engl. Defence Res. Inform. Centre Jan. 1973 44 p refs
(DRIC-BR-33069; S/T-Memo-1/73) Avail: NTIS HC $5.25

Investigation of the fretting fatigue strength of L.65 aluminium alloy and S.98 steel pads showed that the random amplitude loading fretting fatigue strength was almost identical with the sinusoidal constant amplitude fretting fatigue strength. The latter was found to be comparable with previous findings. The plain

unfretted random fatigue strength was found to be approximately 65% of the unfretted constant amplitude loading. Damage tests indicated that fatigue damage was complete within the first 5% of the total random loading fretting fatigue life unlike the constant amplitude loading cases where the damage completion period was more dependent on the applied stress level and varied from 10 to 60% of the constant amplitude fatigue life. It would seem that for the conditions investigated, at the same constant amplitude and random stress levels, the crack initiation and rates of crack propagation are different although the nominal lives to failure are similar. The narrow band random loading spectra was recorded and analyzed, and the data used with Miners Cumulative Damage rule and sinusoidal fatigue data to predict the unfretted and fretting random fatigue lives. Author (ESRO)

N74-18536# Oxford Univ. (England). Lab. of Engineering.
LEAST WEIGHT FRAMEWORKS FOR LOADS ACROSS A SPAN
R. E. McConnel 2 Nov. 1973 35 p Sponsored by Rhode Trust
(Rept-1076/73) Avail: NTIS HC $4.75

Least weight frameworks, as an estimate of minimum cost, were investigated as a limit for comparison with practical structures. Michell structures for a number of simple load cases have been established, and linear programming has been used to find pin-jointed framework approximations of Michell layouts. This approach, along with a method of optimizing the volume of frameworks of fixed topology but variable joint position, is used to investigate layouts for bridge (beam) type loadings. Possible Michell layouts are presented for structures supporting loads acting on the line between a pair of supports. Half plane fully fixed, half plane simply supported, and corresponding full plane situations are considered. These layouts are found to be lighter than any previously proposed structures for this common type of loading. Author (ESRO)

N74-18537# Rocket Propulsion Establishment, Westcott (England).
THE REDUCTION OF HEAT FLUX INTO CRYOGENIC STORAGE VESSELS BY USE OF VAPOUR-COOLED SUPPORT TUBES
T. R. Horton Sep. 1971 53 p refs
(RPE-TR-71/8; BR36745) Avail: NTIS HC $5.75

Methods of calculating the heat leak through a vapor cooled support tube of a cryogenic storage vessel were examined. A rigorous method of calculation was developed and its predictions were compared with limiting solutions and with experiments. The calculations performed for an existing high pressure liquid hydrogen storage vessel constructed of stainless steel lead to the conclusion that the heat leak through a vapor cooled support tube will probably be insignificant. Calculations for stainless steel and aluminum alloy vessels, containing the cryogens helium, hydrogen, nitrogen or oxygen, indicate that in a vessel constructed of an aluminum alloy the heat leak through the neck will be appreciable. Author (ESRO)

N74-18538# Stanford Univ., Calif. Dept. of Applied Mechanics.
PROPAGATION OF A SHOCK WAVE FRONT THROUGH A LENS-SHAPED ELASTIC BODY
T. C. T. Ting (Ill. Univ.) and George Herrmann Oct. 1973 34 p refs
(Grants AF-AFOSR-1905-70; DA-ARO(D)-31-124-72-G87; AF Proj. 9782)
(AD-771555; SUDAM-73-1; AFOSR-73-2139TR) Avail: NTIS CSCL 20/11

Ray theory is used to solve the problem of a plane pressure pulse with a discontinuous pressure front striking an elastic body whose cross section has the shape of a lens. Both plane strain and axisymmetric motions are considered. The front and back surfaces of the lens are assumed to be circular. The velocity and acceleration at the P-wave front and the discontinuity in acceleration at the S-wave front are obtained explicitly for points along the axis of the lens and at the center of the back surface where reflections occur. The purpose of this study is to assess the effect of the curvatures of the lens which can be measured experimentally. Comparison with a laboratory test shows excellent agreement between analytical and experimental results: Author (GRA)

N74-18539# Connecticut Univ., Storrs. Dept. of Metallurgy.
STRUCTURAL FATIGUE Final Report, 15 Sep. 1968 - 15 Sep. 1973
A. J. McEvily, Jr. Sep. 1973 17 p refs
(Contract F44620-69-C-0011; AF Proj. 6813)
(AD-771502; AFOSR-73-2202TR) Avail: NTIS CSCL 11/6

Research programs involved alloy preparation, studies of environmental effects, elevated and room temperature fatigue behavior, creep-fatigue interaction studies, fatigue crack growth in stiffened and unstiffened panels, determination of threshold levels for fatigue crack growth, and an assessment of the role of fracture toughness and mean stress in fatigue crack growth. The fatigue behavior of composite materials as well as of a number of structural materials such as Ti-6Al-4V was investigated. Advances in the use of thermal conductivity to study dislocation arrays have been made, and the use of surface waves to detect and monitor fatigue cracks has been developed. GRA

N74-18540# Aerospace Corp., El Segundo, Calif.
FRACTURE STATISTICS OF ISOTROPIC BRITTLE MATERIAL WITH SURFACE FLAWS Technical Report, Aug. - Sep. 1973
Samuel B. Batdorf 3 Dec. 1973 28 p refs
(Contract F04701-73-C-0074)
(AD-771491; SAMSO-TR-73-378) Avail: NTIS CSCL 20/12

A weakest link theory for macroscopically homogeneous, isotropic, brittle materials, the surfaces of which contain randomly oriented microcracks uniformly distributed with respect to location, is developed under the assumption that fracture depends only on the tensile stress normal to a crack line. The function representing the number of cracks failing at each value of normal stress is very simply determined from fracture statistics for equibiaxial tension. This function is used without additional assumptions to determine the probability of fracture under arbitrary stress conditions. The theory is shown to be in better agreement with extensive experimental data on pyrex cylinders than previously available theories. Author (GRA)

N74-18541# Brown Univ., Providence, R.I.
OPTIMAL STRUCTURAL DESIGN Final Report, 1 Aug. 1971 - 31 Aug. 1973
William Prager 27 Sep. 1973 11 p refs
(Grants DA-ARO(D)-31-124-71-G141; DA-ARO(D)-31-124-71-G1025)
(AD-771050; AROD-8334-38-E) Avail: NTIS CSCL 20/11

Optimality conditions have been established for a wide range of constraints. Im many cases, these conditions could be shown to be necessary and sufficient for global optimality. Problems of multiple constraints or multi-purpose structures were considered, primarily involving beams and trusses. Optimal layout of trusses was examined for single and multiple loading conditions. Systematic design procedures were discussed for a range of problems, and a variety of illustrative examples was presented. Author (GRA)

N74-18542# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
FLEXIBLE PAVEMENT ANALYSIS BY THE THREE DIMENSIONAL FINITE ELEMENT METHOD Final Report
John B. Palmerton Oct. 1973 35 p refs
(AD-770383; AEWES-Misc-Paper-S-73-63) Avail: NTIS CSCL 13/2

The report describes a preliminary study to evaluate the applicability of three-dimensional finite element analysis for predicting the behavior of pavement systems. Since many pavement problems are not reducible to plane behavior, this new analysis technique should provide a good basis for future analysis of complicated pavement systems. The finite element computer program used in this study is designated SOLSAP and was originally developed to investigate the three-dimensional behavior of earth and earth-rock dams. It was used in this study to investigate the effect of a static load application (similar to that produced by the C-5A aircraft) on a flexible pavement section that had been previously field-tested at the U.S. Army Engineer Waterways Experiment Station. SOLSAP considers both non-

linear stress-strain behavior and nonlinear volume characteristics. (Modified author abstract) (GRA)

N74-18543# Illinois Univ., Urbana. Dept. of Civil Engineering.
STRESS-STRAIN RELATIONSHIPS OF REINFORCING BARS SUBJECTED TO LARGE STRAIN REVERSALS
A. E. Aktan, B. I. Karlson, and M. A. Sozen Jun. 1973 53 p refs
(Grant NSF GI-29934)
(PB-224423/4GA; UILU-ENG-73-2014; Ser-397) Avail: NTIS HC $4.75 CSCL 13A

The report describes an analysis of results of cyclic loading tests on No. 6 and No. 9 reinforcing bars strained well into the yield range in both tension and compression. GRA

N74-18544# Princeton Univ., N.J. Dept. of Civil and Geological Engineering.
AEROELASTIC STABILITY OF LONG-SPAN BRIDGES Final Report
Robert H. Scanlan Aug. 1973 37 p refs Sponsored by DOT
(PB-224877/1GA; FHWA-RD-73-75) Avail: NTIS HC $3.00 CSCL 13M

A summary report is made defining state-of-the-art methods and needed research relative to stability of bridges under wind. GRA

N74-18545# Leicester Univ. (England). Fritz Engineering Lab.
WELDED PLATE GIRDERS Final Report
Ben T. Yen Sep. 1973 55 p refs Sponsored by Fed. Highway Admin.
(Proj. 58-4)
(PB-225468/8GA; FEL-327.10F) Avail: NTIS HC $4.75 CSCL 13B

The report summarizes the objectives, research programs, findings and implementation of results from studies in the area of welded plate girders. The static load-carrying capacity and fatigue strength of welded plate girders were studied through analysis and testing. Important results with regard to the strength and behavior of the flanges, web, stiffeners and the complete girder are listed in the report. Design recommendations and implementation statements are presented. Also included are some recommended future studies. Author (GRA)

N74-18546# California Univ., Berkeley. Structural Engineering Lab.
FINITE ELEMENT FORMULATIONS FOR LARGE DISPLACEMENT AND LARGE STRAIN ANALYSIS
Klaus-Jurgen Bathe, Ekkehard Ramm, and Edward L. Wilson Sep. 1973 74 p refs
(Grant NSF CI-36387)
(PB-225300/3GA; UCSESM-73-14) Avail: NTIS HC $5.75 CSCL 20K

Starting from continuum mechanics principles, finite element incremental formulations for nonlinear static and dynamic analysis are reviewed and derived. No new formulation is presented. The aim in the report is a consistent summary, comparison, and evaluation of the two formulations, which are used in the general purpose nonlinear static and dynamic analysis program NONSAP. The general formulations include large displacements, large strains, material nonlinearities and nonconservative forces. For specific solutions in the report, elastic and hyperelastic materials only are considered. The numerical solution of the continuum mechanics equations is achieved in NONSAP using isoparametric finite element discretization. The specific matrices which need to be calculated in the formulations are discussed. Author (GRA)

N74-18547# Army Construction Engineering Research Lab., Champaign, Ill.
COMPUTER PROGRAM FOR THE FINITE ELEMENT ANALYSIS OF CONCRETE AIR FIELD PAVEMENTS Final Report
A. C. Eberhardt and J. L. Willmer Nov. 1973 93 p ref
(DA Proj. 4A6-64717-D-895)
(AD-771160; CERL-TR-S-26) Avail: NTIS CSCL 01/5

The report describes a digital computer program for the finite element analysis of jointed concrete airfield pavements. The program is designed to analyze the static response of a pavement to heavy multi-wheel aircraft gear loads. An equivalent plate theory is used to determine the effect of a stabilized base or a structural overlay on the total response of a pavement system. The subsoil is modeled as a Winkler foundation, i.e., only forces and deformations in the vertical direction are considered. (Modified author abstract) GRA

N74-18548# Lincoln Lab., Mass. Inst. of Tech., Lexington.
INVERSE EIGENVALUE METHOD OF MECHANICAL ADMITTANCE ANALYSIS
Ronald L. Bagley 5 Dec. 1973 55 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-771799; TN-1973-49; ESD-TR-73-249) Avail: NTIS CSCL 20/11

The inverse eigenvalue method of mechanical admittance analysis is a way to calculate a structure's mass and stiffness matrices from measured mechanical admittances. If the structure is modeled as having N degrees of freedom, 4(N sup 2) - 2N quantities must be measured to calculate the 2(N sup 2) elements of the mass and stiffness. Mechanical admittances are measured on a beam structure, and from the experimental data, mass and stiffness matrices are calculated for the beam. The experimentally generated mass and stiffness matrices are compared to the mass and stiffness matrices of a cantilever beam. It is also shown that the format of the experimental data enables efficient use of the iterative method of Stodola to calculate the structure's mode shapes and resonant frequencies. Author (GRA)

N74-18549# Forest Products Lab., Madison, Wis.
DESIGN PARAMETERS FOR TORSION OF SANDWICH STRIPS HAVING TRAPEZOIDAL, RECTANGULAR, AND TRIANGULAR CROSS SECTIONS
H. M. Montrey and Edward W. Kuenzi 1973 37 p refs Revised
(AD-771824; FSRP-FPL-156-Rev) Avail: NTIS CSCL 01/3

Solutions for elastic torsion of sandwich strips with triangular, rectangular, or trapezoidal cross sections are presented as suitable design parameters. Author (GRA)

N74-18550# Brown Univ., Providence, R.I. Dept. of Engineering.
THERMAL AND MECHANICAL ANALYSIS OF WELDED STRUCTURES
Robert E. Nickell and H. David Hibbitt (MARC Anal. Res. Corp.) Aug. 1973 37 p refs
(Contract N00014-67-A-0191-0025)
(AD-771946; TR-4) Avail: NTIS CSCL 13/13

The prediction of the residual state of stress and deformation in a welded structure is one of the most interesting and complex problems in structural mechanics. Stress analysis is considered to be a straightforward application for general-purpose, nonlinear finite element structural programs. A few special features of such analyses, are discussed: (1) the legitimacy of time-dependent plasticity theories for treating the residual stress problem; (2) criteria for choosing plane stress, plane strain, generalized plane strain, or fully three-dimensional models; (3) methods for coping with possible floating solid regions during cooling; and (4) the use of linear constraints to treat weld metal deposition and intermittent contact. GRA

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-18551* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
METHOD FOR DETERMINING THERMO-PHYSICAL PROPERTIES OF SPECIMENS Patent
Robert A. Jones, inventor (to NASA) Issued 5 Feb. 1974 5 p Filed 18 Aug. 1972 Supersedes N73-11972 (11 - 02, p 0243)

(NASA-Case-LAR-11053-1; US-Patent-3,789,654; US-Patent-Appl-SN-281875; US-Patent-Class-73-15R) Avail: US Patent Office CSCL 20M

The square root of the product of thermophysical properties q, c and k, where p is density, c is specific heat and k is thermal conductivity, is determined directly on a test specimen such as a wind tunnel model. The test specimen and a reference specimen of known specific heat are positioned at a given distance from a heat source. The specimens are provided with a coating, such as a phase change coating, to visually indicate that a given temperature was reached. A shutter interposed between the heat source and the specimens is opened and a motion picture camera is actuated to provide a time record of the heating step. The temperature of the reference specimen is recorded as a function of time. The heat rate to which both the test and reference specimens were subjected is determined from the temperature time response of the reference specimen by the conventional thin-skin calorimeter equation.

Official Gazette of the U.S. Patent Office

N74-18552* National Aeronautics and Space Administration. Pasadena Office, Calif.

HEAT TRANSFER DEVICE Patent

Ralph W. Kalkbrenner, inventor (to NASA) (Westinghouse Elec. Corp., Pittsburgh) Issued 5 Feb. 1974 4 p Filed 21 May 1970 Supersedes N70-41524 (08 - 23, p 4427) Sponsored by NASA

(NASA-Case-NPO-11120-1; US-Patent-3,789,920; US-Patent-Appl-SN-39343; US-Patent-Class-165-105; US-Patent-Class-29-157.3R; US-Patent-Class-267-166) Avail: US Patent Office CSCL 20M

A heat transfer device is characterized by an hermetically sealed tubular housing including a tubular shell terminating in spaced end plates, and a tubular mesh wick concentrically arranged and operatively supported within said housing. The invention provides an improved wicking restraint formed as an elongated and radially expanded tubular helix concentrically related to the wick and adapted to be axially foreshortened and radially expanded into engagement with the wick in response to an axially applied compressive load. The wick is continuously supported in a contiguous relationship with the internal surfaces of the shell.

Official Gazette of the U.S. Patent Office

N74-18553*# LTV Aerospace Corp., Dallas, Tex.

THE ENVIRONMENTAL HEAT FLUX ROUTINE, VERSION 4 (EHFR-4) AND MULTIPLE REFLECTIONS ROUTINE (MRR). VOLUME 2: PROGRAMMERS REFERENCE MANUAL Final Report

J. B. Dietz 14 Jun. 1973 86 p

(Contract NAS9-7644)

(NASA-CR-134004; T155-01-Vol-2) Avail: NTIS HC $7.50 CSCL 20M

The EHFR program reference information which is presented consists of the following subprogram detailed data: purpose-description of the routine, a list of the calling programs, an argument list description, nomenclature definition, flow charts, and a compilation listing of each subprogram. Each of the EHFR subprograms were developed specifically for this routine and do not have an applicability of a general nature. Single precision accuracy available on the Univac 1108 is used exclusively in all but two of the 31 EHFR subprograms. The double precision variables required are identified in the nomenclature definition of the two subprograms that require them. A concise definition of the purpose, function, and capabilities is made in the subprogram description. The description references the appropriate Volume 1 sections of the report which contain the applicable detailed definitions, governing equations, and assumptions used. The compilation listing of each subprogram defines the program/data storage requirements, identifies the labeled block common data required, and identifies other subprograms called during execution. For Vol. 1, see N73-31842. Author

N74-18554*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OPTICAL MEASUREMENT OF STATIC TEMPERATURE AND HYDROXYL RADICAL PROFILES IN A HYDROGEN-FUELED SUPERSONIC COMBUSTOR

Raymond E. Gaugler Washington Mar. 1974 15 p refs

(NASA-TM-X-3004; E-7797) Avail: NTIS HC $3.00 CSCL 20M

Profiles of static temperature and hydroxyl radical concentration were measured in a two-dimensional supersonic combustor test section 22.8 cm downstream of hydrogen injection. A high-pressure gas generator supplied vitiated air to the test section at Mach 2.44, atmospheric pressure, and a total temperature of about 2240 K. Room-temperature hydrogen was injected through a 0.40-cm step slot at Mach 1 and matched pressure. The measurements utilized a noninterfering spectral line absorption technique in which narrow ultraviolet emission lines of the hydroxyl electronic transition are absorbed by the broader absorption lines in the combustion gas. Comparison of the measured temperature profiles with theoretical calculations showed good agreement.

Author

N74-18555*# Chrysler Corp., New Orleans, La. Space Div.

EFFECT OF WALL TO TOTAL TEMPERATURE RATIO VARIATION ON HEAT TRANSFER TO THE LEESIDE OF A SPACE SHUTTLE CONFIGURATION AT M EQUALS 10.3

James C. Dunavant (NASA. Langley Res. Center) Feb. 1974 60 p refs

(Contract NAS9-13247)

(NASA-CR-134086; DMS-DR-2047) Avail: NTIS HC $6.00 CSCL 20M

An experimental study has been conducted of the influence of wall to total temperature ratio on the heat transfer to the leeside of a 040A space shuttle configuration. The heat transfer tests were made at a Mach number of 10 and a Reynolds number of one million per foot for angles of attack from 0 deg to 30 deg. Range of wall to total temperature ratio was from 0.16 to 0.43. Where the heat transfer was relatively high and the laminar boundary layer attached, the local heat transfer decreased by about 20 percent as the wall to total temperature ratio was increased from the minimum to the maximum test value. On regions of separated flow and vortex reattachment, very low heating rates were measured at some conditions and indicate significant changes are occurring in the leeside flow field. No single trend of heat transfer variation with wall to total temperature ratio could be observed. Author

N74-18556*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

TWO-DEMENSIONAL ANALYSIS OF HEAT AND MASS TRANSFER IN POROUS MEDIA USING THE STRONGLY IMPLICIT PROCEDURE

Donald M. Curry Washington Mar. 1974 36 p refs

(NASA-TN-D-7608; JSC-S-382) Avail: NTIS HC $3.25 CSCL 20M

Numerical results of the heat and mass transfer in a porous matrix are presented. The coupled, nonlinear partial differential equations describing this physical phenomenon are solved in finite difference form for two dimensions, using a new iterative technique (the strongly implicit procedure). The influence of the external environment coditions (heating and pressure) is shown to produce two-dimensional flow in the porous matrix. Typical fluid and solid temperature distributions in the porous matrix and internal pressure distributions are presented. Author

N74-18557*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LIGHT BULB HEAT EXCHANGER FOR MAGNETOHYDRODYNAMIC GENERATOR APPLICATIONS - PRELIMINARY EVALUATION

J. Marlin Smith, Charles C. Hwang (Pittsburgh Univ.), and George Seikel, R. Washington Mar. 1974 29 p refs

(NASA-TN-D-7534; E-7593) Avail: NTIS HC $3.25 CSCL 20M

The light-bulb heat-exchanger concept is investigated as a possible means of using a combustion heat source to supply energy to an inert gas MHD power generator system. In this concept, combustion gases flow through a central passage which consists of a duct with transparent walls through which heat is transferred by radiation to a radiation receiver which in turn heats the inert gas by convection. The effects of combustion-gas emissivity, transparent-wall-transmissivity, radiation-receiver emissivity, and the use of fins in the inert gas coolant passage are studied. The results indicate that inert gas outlet temperatures

of 2500 K are possible for combustion temperatures of 3200 K and that sufficient energy can be transferred from the combustion gas to reduce its temperature to approximately 2000 K. At this temperature more conventional heat exchangers can be used. Author

N74-18558*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AERODYNAMIC HEATING AND LOADING WITHIN LARGE OPEN CAVITIES IN CONE AND CONE-CYLINDER-FLARE MODELS AT MACH 6.7
Roane L. Hunt Washington Mar. 1974 56 p refs
(NASA-TN-D-7403; L-9157) Avail: NTIS HC $3.75 CSCL 01A

The aerodynamic heating and loading distributions within large cavities exposed by surface openings to hypersonic flow were determined in the 8-foot high-temperature structures tunnel. Cone and cone-cylinder-flare models with cavities having regular and irregular surface-opening shapes were aerothermally tested at various angles of attack up to 30 deg. Tests were conducted at a Mach number of 6.7, a total temperature of 1800 K, a dynamic pressure of 80 kPa, and a stream unit Reynolds number of 6,000,000 per meter. The results showed that the heating rates at internal reattachment were generally lower but of the same order as the corresponding external heating rates; however, other internal heating rates were an order of magnitude lower. The internal flow showed characteristics of being funneled into jets or being dispersed dependent upon the internal surface contour. Author

N74-18559# Los Alamos Scientific Lab., N.Mex.
ROCKET-BORNE, LOW GRAVITY CRYOGENIC HEAT TRANSFER EXPERIMENT
K. D. Williamson, Jr., F. J. Edeskuty, and J. F. Taylor [1973] 9 p refs Presented at AIAA/NSA/ASTM/IES 7th Space Simulation Conf., Los Angeles, 12-14 Nov. 1973
(Contract W-7405-eng-36)
(LA-UR-73-1067; Conf-731108-1) Avail: NTIS HC $3.00

In order to obtain steady state data on nucleate boiling heat transfer to liquid helium in a nearly zero gravity environment a rocket-borne experiment was designed, built, and successfully flown. A description of the apparatus and flight is presented along with preliminary results. Author (NSA)

N74-18560# Kansas Univ., Lawrence. Dept. of Chemistry.
HIGH TEMPERATURE THERMODYNAMICS AND KINETICS Final Report, 1 Jun. 1969 - 31 Aug. 1972
Paul W. Gilles Oct. 1973 7 p refs
(Grant DA-ARO(D)-31-124-69-G1133)
(AD-771054; AROD-8464-5-C) Avail: NTIS CSCL 07/4

A brief summary of a research program on high temperature vaporization kinetics is presented. Author (GRA)

N74-18561# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF A DEFLECTOR GEOMETRY ON HEAT TRANSFER IN THE COOLING LOOP OF DEFLECTOR VANES
E. P. Dyban, A. I. Mazur, and V. E. Filipchuk 27 Nov. 1973 14 p refs Transl. into ENGLISH from Teplofiz. i Teplotekh. (USSR), no. 21, 1972 p 67-73
(AD-771605; FTC-HT-23-311-74) Avail: NTIS CSCL 21/5

The principal results of experimental research into the mechanisms of airflow and heat transfer in deflector vanes of gas turbines are presented in previous reports and the procedures for carrying out the experiments and analysis of their results are described. In the current article the experimental data obtained are used for comparative analysis of the influence of type and dimensions of deflectors on the rate of heat transfer in a cooling loop. GRA

N74-18562# Naval Weapons Center, China Lake, Calif.
THE PUNCH CHARGE
John Pearson Dec. 1973 40 p ref
(ZR0000101)
(AD-771421; NWC-TP-5556) Avail: NTIS CSCL 19/1

The punch charge is a novel metal-explosive configuration used to produce relatively large-diameter holes through steel target plates. The report treats several design configurations and describes the corresponding target response patterns in steel plates for a thickness range of 3/4 to 2 inches based on macrostructural studies and high-speed photographic analysis. Design parameters such as case thickness and explosive geometry are discussed relative to target hole size, mass of target metal removed, and target plug velocities. Author (GRA)

N74-18563# Ballistic Research Labs., Aberdeen Proving Ground, Md.
DETERMINATION OF BASE DRAG REDUCTION FOR VARIOUS FUMER MIXES
Richard K. Pahel Nov. 1973 20 p refs
(DA Proj. 1W5-62604-A-600)
(AD-771134; BRL-MR-2339) Avail: NTIS CSCL 19/1

A test program to determine the base drag reduction due to burning fumer materials was conducted in a blow down wind tunnel. Of the five materials tested, two acted as drag reducers, one gave little drag reduction and two would not burn at the wind tunnel conditions. Heat of combustion values were calculated and also determined experimentally for the five fumer materials. Author (GRA)

N74-18564# Bureau of Mines, Bartlesville, Okla.
NATURAL GAS AS AN AUTOMOTIVE FUEL, AN EXPERIMENTAL STUDY
R. D. Fleming and J. R. Allsup Oct. 1973 32 p refs
(PB-225287/2GA; BM-RI-7806) Avail: NTIS HC $3.00 CSCL 21D

A study was conducted to evaluate natural gas as an automotive fuel and to provide guidelines for optimum engine adjustments for low exhaust emissions. The study was conducted using a single-cylinder engine, a multicylinder engine, and a total of eight vehicles. Low emissions can be achieved with current-design engines by adjustment of engine parameters, but only with heavy penalty to engine performance. Air-fuel ratio, ignition timing, and ambient temperature were varied. The organic emissions from engines fueled with natural gas were estimated to be 22 to 25 pct as reactive as the emissions produced using gasoline. Levels of exhaust emissions from vehicles fueled with natural gas were unchanged over 10,000 miles of normal driving. Author (GRA)

N74-18565# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
THE INTERACTION OF A HYPERSONIC PLUME WITH AN EXTERNAL HYPERSONIC STREAM
John T. Kelly Jul. 1973 164 p refs
(Contract DAHC04-69-C-0077; ARPA Order 1442)
(AROD-8677-39-P; AD-771157; PIBAL-73-12) Avail: NTIS CSCL 16/3

A theoretical study of the gas dynamic interaction between a hypersonic plume and the opposed hypersonic external stream is presented. Steady, axisymmetric, inviscid, perfect gas flow is postulated for both the bow and far field regions. Limiting forms of solutions are obtained for the bow region by application of the Newton-Busemann approximation to both the exhaust plume and ambient air flow. Through asymptotic expansions and their matching, it is found that six regions are required to adequately describe the bow region. For the far field region, the hypersonic small-disturbance form of the Newton-Busemann approximation is applied. (Modified author abstract) GRA

N74-18566# American Air Filter Co., Inc., St. Louis, Mo.
SOLID-STATE ENVIRONMENTAL CONTROL SYSTEM Final Report, Jul. 1970 - Aug. 1973
J. D. Fischer Sep. 1973 95 p refs
(Contract DAAK02-70-C-0628)
(AD-771154; MKP-306) Avail: NTIS CSCL 13/1

The effect of thermoelectric cooling has been known since the early 1800's. This report covers the effort necessary to design, develop, and build an environmental control system employing the Peltier effect and solid-state controls. The results of the program suggest that although a workable system is feasible, the state-of-the-art, as related to thermoelectric devices and the materials from which they are made, is not sufficiently advanced to replace existing systems on a practical basis. The

use of solid-state controls in an environmental control system did, however, prove successful and practical. Author (GRA)

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-18567# Joint Publications Research Service, Arlington, Va.
VESTNIK OF THE USSR ACADEMY OF SCIENCES, NO. 7, JULY 1973
18 Sep. 1973 181 p refs Transl. into ENGLISH of Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 (JPRS-60065) Avail: NTIS HC $12.25

Research work reported covers solid state physics, astrophysics, aeronomy, aerodynamics, plasma physics, and atomic structure. For individual titles, see N74-18568 through N74-18580.

N74-18568 Joint Publications Research Service, Arlington, Va.
PLASMA PROCESSES IN METALLURGY AND THE TECHNOLOGY OF INORGANIC MATERIALS c17
In its Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 1-7 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 3-7 (For availability see N74-18567 09-34)

The importance of plasma processes for the production of metals from ores, the synthesis of metallic and nonmetallic powders, the refining and alloying of metals, and the chemical pyrolysis of petroleum and fertilizers is projected. Plasma arc melting and remelting processes for growing single crystals of refractory metals and the development of metallic matrices are especially of industrial interest. G.G.

N74-18569 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF VENUS WITH INTERPLANETARY STATIONS c31
N. F. Borodin and V. I. Osmakov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 8-14 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 8-12 (For availability see N74-18567 09-34)

Venera satellite observations of the physicochemical Venus atmosphere properties show the characteristics of vertical gas mixing. Measurements of temperature and pressure during descent and landing on Venus surface provided no noticable difference between night and day values at the place of landing; the temperature was 743 plus or minus 8K and the pressure was 90 plus or minus 1.5 at. Measurements of luminosity indicated a greenhouse effect in the surface heating mechanism, and gas analysis found a small amount of ammonia in Venus atmosphere. Gamma spectrometry data established that the surface layer contains potassium, uranium, and thorium. G.G.

N74-18570 Joint Publications Research Service, Arlington, Va.
THE CENTENARY OF THE JOURNAL OF EXPERIMENTAL AND THEORETICAL PHYSICS AND THE ROLE OF JOURNALS IN THE DEVELOPMENT OF SCIENCE c23
P. L. Kapitsa *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 15-24 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 13-21 (For availability see N74-18567 09-34)

The historic development of the scientific journal is recapitulated and its continuing use to provide general physics information is considered. A need is felt that the continuing spread of scientific information requires new information methods that include electronic technology. G.G.

N74-18571 Joint Publications Research Service, Arlington, Va.
ACOUSTICS OF A CONTROLLED BOUNDARY LAYER c12
L. M. Lyamshev *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 26-38 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 22-31 (For availability see N74-18567 09-34)

Results of theoretical and experimental investigations on the characteristics of the near noise field show that control of the boundary layer affects aerodynamic acoustic effects. It is proposed that suction and introduction of polymeric additives are used to change turbulence generation in the wall flow boundary layer. G.G.

N74-18572 Joint Publications Research Service, Arlington, Va.
CHEMICAL ENGINEERING AND BASIC RESEARCH c06
N. M. Zhavoronkov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 40-47 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 32-36 (For availability see N74-18567 09-34)

Analysis of the requirements of industry and the state of chemical engineering shows the importance of fundamental investigations in planning efficient mass exchangers, chemical reactors and fermenters, plasma methods, microbiological extractions techniques, etc. Physical and mathematical modelling for engineering formulations of technological processes provide for a high degree of reliability and minimum inputs of materials. G.G.

N74-18573 Joint Publications Research Service, Arlington, Va.
STUDY OF THE DYNAMICS OF AEROSOLS c13
B. V. Deryagin *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 48-57 Transl. into ENGLISH of Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 38-44 (For availability see N74-18567 09-34)

The mechanics of moving particles are considered in designing industrial condensation and trapping equipment. Calculations on thermal slipping and thermophoretic force and velocity provide solutions on the basis of statistics, the kinetic theory of gases, and molecular physics. G.G.

N74-18574 Joint Publications Research Service, Arlington, Va.
MODERN AERONOMICAL PROBLEMS c13
A. D. Danilov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 59-68 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 45-51 (For availability see N74-18567 09-34)

The dynamics of the atmosphere and the photochemistry of excited particles are considered in examining mass spectra of the ionosphere and the problem of night ionization. G.G.

N74-18575 Joint Publications Research Service, Arlington, Va.
WINDS AND DRIFTS IN THE IONOSPHERE c13
E. S. Kazimirovskiy *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 69-81 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 52-62 (For availability see N74-18567 09-34)

The principles of ionospheric dynamic meteorology are developed from investigations of ionospheric drift. A theory of motion is formulated that considers electric fields in the ionosphere, data on the dynamics of the neutral atmosphere, and the connection of the dynamics of the ionosphere with magnetospheric and meteorological processes. Experimental methods of measuring drift are improved by various techniques and radio methods are calibrated by direct measurements. Regular synoptic drift measurments on a global scale by a network of stations to study the circulation of the atmosphere in ionic levels are projected. G.G.

N74-18576 Joint Publications Research Service, Arlington, Va.
METASTABLE IONOSPHERIC PARTICLES c13
M. N. Vlasov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 83-91 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, 1973 p 63-69 (For availability see N74-18567 09-34)

The formation of excited particles in the upper atmosphere is attributed to dissociation of atmospheric components through ultraviolet solar radiation, resonance scattering by radiation absorption at wavelengths corresponding to transitions into the metastable states, exothermic reactions with dissociative

atmospheric ion recombinations, and excitation of atmospheric gas by high energy electrons. G.G.

N74-18577 Joint Publications Research Service, Arlington, Va.
FIFTH INTERNATIONAL CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS c04
N. M. Emanuel, L. P. Kayushin, and Ya. I. Azhipa *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 p 103-106 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 77-78 Conf. held at New York, 4-8 Dec. 1972 (For availability see N74-18567 09-34)

Methods of EPR, NMR and double resonance are reported for studying structures and functions of individual molecules and organelles; mentioned are investigations on hemoglobin, enzymes and their reactions, radiation effects on DNA, biological membranes, muscle proteins, and clinical applications to detect cancerous tissues. G.G.

N74-18578 Joint Publications Research Service, Arlington, Va.
LOW-TEMPERATURE PLASMA AND ITS APPLICATION c25
N. N. Rykalin and V. V. Kudinov *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 107-110 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 79-81 Conf. held at Moscow, 29-30 Mar. 1973 (For availability see N74-18567 09-34)

The contemporary level and problems of plasma arc melting, -gas conversion, and -cutting in metallurgy and inorganic material processing are briefly reported. Application of plasma technology to ore processing, metal refining, and synthesis of metallic and nonmetallic powder is recommended. G.G.

N74-18579 Joint Publications Research Service, Arlington, Va.
CHARGE TRANSFER AND ITS INFLUENCE ON THE PROPERTIES OF MOLECULES OF ORGANIC COMPOUNDS c24
Z. V. Todres *In its* Vestn. of the USSR Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 111-115 Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 81-84 Conf. held at Riga, 19-21 Mar. 1973 (For availability see N74-18567 09-34)

The role of complexes with charge transfer was studied for the reaction mechanism during halogenation of olefins, polymerization of alkylpropargylamine mixture with organic acceptors, and unsaturated polymer formation with tetracyanoquinodimethane. New methods for detecting intra- and intermolecular complexes used Hall effects and electronic spin echoes during transformation of an organic molecule into an ion-radical salt. G.G.

N74-18580 Joint Publications Research Service, Arlington, Va.
HEAT-RESISTANT COATINGS c18
A. Ya. Sitnikova *In its* Vestn. of the USSR, Acad. of Sci., No. 7, Jul. 1973 (JPRS-60065) 18 Sep. 1973 p 116-119 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1973 p 85-87 Conf. held at Leningrad, 20-23 Mar. 1973 (For availability see N74-18567 09-34)

Physicochemical principles are considered in obtaining heat resistant coatings for the protection of structural materials. Surface effects are evaluated with respect to chemical combinations of solid phases, processes of adhesion and wetting of solids by fusion processes. Sputtering, diffuse saturation, precipitation from gaseous phase, and high temperature oxidation methods for annealed coatings are reported. G.G.

N74-18581# Committee on Interior and Insular Affairs (U. S. Senate).
NATIONAL WATER COMMISSION REPORT
Washington GPO 1973 433 p refs Hearings before Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 28 Jun. and 17 Jul. 1973
Avail: Subcomm. on Water and Power Resources

The hearings are presented concerning the National Water Commission report on the national water resources problems. The need to protect the environment by coordinating land use and water planning functions is emphasized. Recommendations for improving water resources policies include: (1) Future water programs should shift emphasis from water development to preservation and enhancement of water quality. (2) planning for water development must be linked to planning for water quality and coordinated with land use planning. (3) More efficient use of water in agriculture, industry, and for domestic and municipal purposes is essential to reduce waste. Some of the recommendations in the Commission's report are addressed to the President, some to the Congress, and others to various Federal and State agencies, or to the water industry and the public generally. F.O.S.

N74-18582# Mitre Corp., McLean, Va.
SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 1: SESSION ON INTERNATIONAL ISSUES
12 Apr. 1972 227 p Conf. held at McLean, Va., 12 Apr. 1972 Revised 3 Vol.
(M72-69-Vol-1-Rev-2) Avail: NTIS HC $14.50

Technological and capital requirements to meet the growing international storage in energy by better and expanded exploitation of resources is discussed. Interwoven aspects of limited growth versus full scale growth societies are considered. For individual titles, see N74-18583 through N74-18590.

N74-18583 Mitre Corp., McLean, Va.
INTRODUCTORY REMARKS
Charles A. Zraket *In its* Symp. on Energy, Resources and the Environment, Vol. 1 12 Apr. 1972 p 1-12 (For availability see N74-18582 09-34)

The interrelationships or linkages between economic growth, environmental impact, international problems, and definition of a consensual ethic in the worldwide energy sources development are discussed. It is stipulated that the increasing real costs of energy have a decisive impact on all policies of decision makers and that alternatives need to be developed on research in resource exploration and extraction. G.G.

N74-18584 Hudson Inst., Inc., Croton-on-Hudson, N.Y.
CONTEXT OF THE SESSION THEME, INTERNATIONAL ISSUES
Robert B. Panero *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 1 12 Apr. 1972 p 13-28 (For availability see N74-18582 09-34)

A study framework is projected that considers the context for international issues on energy demands, energy sources, and environmental values. Various possible prospective views are explored that project growth on resource dependence for various economic areas of the globe. G.G.

N74-18585 Massachusetts Inst. of Tech., Cambridge.
COMPUTER SIMULATION OF WORLD DYNAMICS AND IMPLICATIONS FOR POLICY DECISIONS
Jay Forrester *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 1 12 Apr. 1972 p 29-48 (For availability see N74-18582 09-34)

It is stipulated that energy and resource policies are coupled to social issues. The effects of technology in social breakdown are stressed and it is suggested that energy demands should not be fully met for the long term good of society. Instead, the growth rate in the use of energy and resources should be gradually reduced so that demands no longer rise. The inevitable slowing of growth requires adjustment of our system policies on ethics, rightness, and humanitarianism to new concepts of human equality. G.G.

N74-18586 Hudson Inst., Inc., Croton-on-Hudson, N.Y.
ECONOMIC BASIS FOR ENERGY AND RESOURCE USE
Herman Kahn *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 1 12 Apr. 1972 p 48-104 (For availability see N74-18582 09-34)

An economic basis for energy and resource use to solve international societal problems in the future is presented. G.G.

N74-18587 California Univ., Livermore. Lawrence Livermore Lab.
ENERGY IN GENERAL
Glenn C. Werth *In* Mitre Corp. Symp. on Energy Resources and the Environment, Vol. 1 12 Apr. 1972 p 105-136 refs (For availability see N74-18582 09-34)

Technical aspects of providing energy and utilizing resources for world-wide demand are considered. Projected energy flow patterns recognize growth demands fossil fuel reserves that require definite economic and technological adjustments. Better utilization of the coal and oil shale resources can be obtained by secondary and tertiary recovery methods such as water flood and fire flood, or nuclear explosions, a move to gasefying coal underground also seems to be feasible. Nuclear breeder reactor development is technically proven but economic feasibility must be considered. Solar energy source developments require storage facilities in principle; hydrogen seems to be the best product to be used as a fuel and possible for transportation markets. Emphasis is placed on making all these fuel resources available at acceptable prices for the world's community. G.G.

N74-18588 Mitre Corp., McLean, Va.
THE INTERNATIONAL ASPECTS OF IMPORTING NATURAL GAS
Robert A. Charpie *In its* Symp. on Energy, Resources and the Environment, Vol. 1 12 Apr. 1972 p 136-153 (For availability see N74-18582 09-34)

Importation of liquefied natural gas from Algeria to eliminate the expected natural gas shortage in the U.S.A. requires the adjustment of regulatory limitations to foreign currencies, the building of cryogenic tankers to transport liquid methane, and the building of terminal facilities in the east coast of the United States. G.G.

N74-18589 Massachusetts Inst. of Tech., Cambridge.
REMARKS
Jay Forrester *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 1 12 Apr. 1972 p 154-157 (For availability see N74-18582 09-34)

The question whether or not the required capital will be available if technology did manage to meet energy and resource shortages, mounting pollution, and food shortages, is considered. Solving this real problem by a computer simulation model demands internal consistency between present assumptions and future expectations in technology, sociology, value structures, and long term versus short term conflicts. G.G.

N74-18590 Hudson Inst., Inc., Croton-on-Hudson, N.Y.
REMARKS
Herman Kahn *In* Mitre Corp. Symp. on Energy, Resources and Environment, Vol. 1 12 Apr. 1972 p 157-170 (For availability see N74-18582 09-34)

World capital requirements to meet energy and resources shortages in 2100 relative to GNP will be about five to one. In order to maintain this projected growth to the year 2100 an accumulation of about two quadrillion dollars worth of capital is necessary. It is stipulated that capital accumulation of five percent a year does not seem to be a problem for the U.S.A. G.G.

N74-18591# Mitre Corp., McLean, Va.
SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. SESSION ON ETHICS AND ENVIRONMENTAL ASPECTS OF THE DEMAND FOR AND USE OF ENERGY, VOLUME 2
13 Apr. 1972 253 p Conf. held at McLean, Va., 13 Apr. 1972 Revised 3 Vol.
(M72-69-Vol-2-Rev-1) Avail: NTIS HC $15.75

Environmental ethics affect research and development of alternative energy sources as well as the more efficient exploitation of existing resources leading to a more equal distribution of wealth and the socioeconomic burden in a population. For individual titles, see N74-18592 through N74-18597.

N74-18592 Virginia Univ., Charlottesville.
NATIONAL ENERGY POLICIES
Fred Singer *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 2 13 Apr. 1972 p 2-27 (For availability see N74-18591 09-34)

It is stressed that socioeconomic considerations require the development of abundant and low cost energy in a national policy. The energy should be environmental clean and reasonable self-sufficient to insure long term national security. Public policies and regulations and a lead agency are required to assume these responsibilities and to fund the various sources of energy exploration. G.G.

N74-18593 California Univ., Livermore. Lawrence Livermore Lab.
AN ENERGY ETHIC
Marvin R. Gustavson *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 2 13 Apr. 1972 p 28-67 (For availability see N74-18591 09-34)

The development of a consensual energy ethic is projected that leads to public agreement as to what is fair in respect to the various aspects of source development. Key issues are: Source development -- particularly of fossil fuel; energy use -- as affected by education, advertising, and legislation; (3) nationalism -- in the national security sense as seen by a citizen of a consuming nation; (4) pollution -- as a negative factor in the quality of life; (5) Federal funding -- as an element of public support; and (6) fusion reactors -- as an example of a possible technological key to abundant energy. G.G.

N74-18594 Mitre Corp., McLean, Va.
ISSUES INVOLVED IN DEVELOPING AN ENVIRONMENTAL ETHIC
S. David Freeman *In its* Symp. on Energy, Resources and the Environment, Vol. 2 13 Apr. 1972 p 68-89 (For availability see N74-18591 09-34)

Issues involved in developing energy and environmental ethics rest on a basic collision of values between a society that is built on an abundant supply of energy and a society that has adopted an environmental concern. It is shown that the U.S. consumes thirty to thirty-five percent of the world's resources each year with six percent of the world's population and that the rest of the world is two-thirds in a perpetual blackout. A policy of conservation and saving, and a more even distribution of the world's resources necessitates inherent redistribution of wealth until research and development efforts produce more environmentally compatible sources of energy. G.G.

N74-18595 Mitre Corp., McLean, Va.
ENVIRONMENTAL ISSUES AND INSTITUTIONAL ARRANGEMENTS
John F. OLeary *In its* Symp. on Energy, Resources and the Environment, Vol. 2 13 Apr. 1972 p 90-135 (For availability see N74-18591 09-34)

A comprehensive set of energy, resource and environmental issues is presented. Some changes to governmental institutions for dealing with the energy crisis are described that encompass pricing, depletion allowances, oil imports, and environmental regulations. G.G.

N74-18596 Harvard Univ., Cambridge, Mass.
MECHANISMS FOR ACHIEVING CLEANER POWER, PRICES, REGULATIONS
Marc Roberts *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 2 13 Apr. 1972 p 136-187 (For availability see N74-18591 09-34)

The following three policy mechanisms to achieve cleaner power are appraised: prices, regulation, and direct public provision. It is shown that the resource-environmental-energy linkup at the current level of pollution is due to multiplicative interaction of the amount of output per capita, the number of people, and the amount of pollution per unit output. The need for shifting some of the distribution impact of the projected financing burden from the poor population is emphasized. G.G.

N74-18597 Mitre Corp., McLean, Va.
ENVIRONMENTAL ISSUES, AN OVERVIEW
Richard S. Greeley *In its* Symp. on Energy, Resources and the Environment, Vol. 2 13 Apr. 1972 p 188-208 (For availability see N74-18591 09-34)

The environmental issues discussed are: (1) Waste heat and its effect on temperature of the earth; (2) air pollution by scoot, sulfur and auto emissions; (3) radioactivity in catastrophic accident and local release, at background levels, and in the forever problem; (4) power plant and industrial facility siting; (5) strip and open pit mining; (6) offshore exploration and drilling; (7) wilderness and remote area exploitation; and (7) zero growth projection. It is concluded that in the long run the conservation of energy in

order to conserve the environment cannot be overlooked and that research and development to find alternative resources will increase the energy cost factor markedly. G.G.

N74-18598# Mitre Corp., McLean, Va.
SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 3: SESSION ON OPTIONS FOR THE FUTURE AND THEIR RESOURCES, ECONOMIC, AND ENVIRONMENTAL EFFECTS
14 Apr. 1912 9198 p refs Conf. held at McLean, Va. 14 Apr. 1972 Revised 3 Vol.
(M72-69-Vol-3-Rev-1) Avail: NTIS HC $13.00

Energy demands and sources are considered and economic and environmental aspects of future resource developments are discussed. For individual titles, see N74-18599 through N74-18604.

N74-18599 Atomic Energy Commission, Washington, D.C.
ENERGY OPTIONS FOR THE FUTURE
Clarence E. Larson *In* Mitre Corp. Symp. on Energy, Resources, and the Environment, Vol. 3 14 Apr. 1972 p 1-20 (For availability see N74-18598 09-34)

New technologies in energy conversion and new energy resources are considered that range from electric cars, solar energy conversion, magnetohydrodynamic power, geothermal energy, and nuclear fusion processes. The dominant role of the liquid metal cooled breeder reactor for providing future energy is emphasized. G.G.

N74-18600 Institute of Energy Economics of Japan.
ENERGY DEMAND IN JAPAN, 1975 TO 1985
Masao Sakisaka *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 3 14 Apr. 1912 p 20-31 (For availability see N74-18598 09-34)

The outlook on Japanese demand for energy and supplies for meeting this demand until 1985 is discussed. Indigenous sources of energy will meet only seven percent of the total energy demand; this neccessitates the development of electric nuclear power plants in Japan and of uranium resources in overseas countries. Disposal of radioactive wastes poses a serious environmental problem. G.G.

N74-18601 National Center for Atmospheric Research, Boulder, Colo. Lab. of Atmospheric Science.
WHAT WE CAN SAY ABOUT CLIMATE CHANGE
William W. Kellogg *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 3 14 Apr. 1972 p 31-67 ref (For availability see N74-18598 09-34)

Possible climatic changes due to very large amounts of man made energy release are considered. It is shown that most changes made to the surface of the earth result in more solar radiation absorption and that addition of any particles to the earth atmosphere probably results in a cooling effect. It is possible that this particle release may be a remedy for the man made warming trend on earth which could eliminate the Arctic ice pack and create an open Arctic Ocean with changes in atmospheric circulation patterns. G.G.

N74-18602 Citizens' Advisory Committee on Environmental Quality, Washington, D.C.
MAJOR R&D PROGRAMS TO MEET THE ENERGY CRISIS
Lelan F. Sillin, Jr. *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 3 14 Apr. 1972 p 68-80 ref (For availability see N74-18598 09-34)

The review of restrictive environmental protection laws and regulations is advocated in order to construct and operate new power facilities that insure increased electric energy demands for future economic growth in the U.S. Long term payoffs for society require power supply systems which produce and transmit abundant, reliable and cheap power without depletion of natural resources. Research on the use of solar energy, fusion power, large scale production of hydrogen, or an optimum blending of several of these concepts is projected for future energy supply systems. G.G.

N74-18603 Sierra Club, Washington, D.C. Energy Policy Committee.
MAN VERSUS HIS INSTITUTIONS
Keith Roberts *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 3 14 Apr. 1972 p 83-109 ref (For availability see N74-18598 09-34)

The goals of a rational energy policy encompass: (1) limitation of total energy consumption to those amounts necessary for a quality of life compatible with the carrying capacity of the environment; (2) use of a combination of energy sources for maximum efficiency; (3) minimization of ecological disruption, aesthetic harm, or damage to human and animal health; (4) public policy making procedures to achieve above goals; and (5) elimination of undue special interest propaganda based on one-sided facts. G.G.

N74-18604 Office of Science and Technology, Washington, D.C.
ENERGY OPTIONS
Richard E. Balzhiser *In* Mitre Corp. Symp. on Energy, Resources and the Environment, Vol. 3 14 Apr. 1972 p 109-129 (For availability see N74-18598 09-34)

Technological options to solving the energy problem constitute development of the liquid metal gas breeder reactor to produce nuclear energy; coal gasification to produce a synthetic natural gas; and SO2 removal technology from stack gases to permit high sulfur coal burning. Fusion, solar, and geothermal energies are prime candidates for supplementing above primary needs. Author

N74-18605# Committee on Aeronautical and Space Sciences (U. S. Senate).
ENERGY-RELATED RESEARCH AND DEVELOPMENT
Washington GPO Mar. 1974 95 p refs Presented to Comm. on Aeron. and Space Sci., 93d Congr., 2nd Sess., Mar. 1974 Prepared by NASA, Washington, D. C.
Avail: SOD HC $1.00

Technology developed for space and aeronautics has useful applications to energy needs and problems on earth. The specific research and development projects include work in solar energy utilization, including wind energy systems; energy conversion, transmission and storage; transportation systems; and energy and environment conservation. Programs in aeronautics and space which are directly relevant to energy include remote sensing applied to energy resources, fuel conservation in aeronautics, energy consversion and storage, and space and nuclear technology. The transfer to the private sector of aeronautical and space technology applicable to energy needs is another way in which significant contributions are made in energy research and development. Author

N74-18606# RAND Corp., Santa Monica, Calif.
THE POTENTIAL FOR ENERGY CONSERVATION IN COMMERCIAL AIR TRANSPORT
James J. Mutch Oct. 1973 90 p refs
(Grant NSF GI-44)
(R-1360-NSF) Avail: NTIS HC $7.50

The potential is examined for reducing the energy requirements of the U.S. commercial airlines, with emphasis on the certificated-route air carriers. Measures stressed are independent of the level of traffic demand. They are intended to reduce energy requirements by decreasing the energy intensity of air transport. The possibility is examined of substituting more efficient transport modes for aviation in short-haul routes and the attendant net energy savings is assesed. Measures that yield benefits in both the short and long term are considered and their conservation potentials are quantified relative to present and future energy requirements. The results should be of interest to those involved in airline activities, including governmental regulatory and policymaking bodies, industry groups, and the airlines themselves. Author

N74-18607# RAND Corp., Santa Monica, Calif.
TRANSPORTATION ENERGY USE IN THE UNITED STATES: A STATISTICAL HISTORY, 1955 - 1971
James J. Mutch Dec. 1973 54 p refs
(Grant NSF GI-44)
(R-1391-NSF) Avail: NTIS HC $5.75

Total transportation energy consumption is considered in view of increased travel per person and an increasing use of more energy intensive modes. Energy distribution for modes and markets is shown from 55 to 71 in graphical form. Freight and passenger

transportation on highways, aircraft, railroads, and waterways are also reviewed. J.A.M.

N74-18608# RAND Corp., Santa Monica, Calif.
TECHNOLOGY EXCHANGE BETWEEN THE UNITED STATES AND THE SOVIET UNION
Charles Wolf, Jr. Dec. 1973 7 p refs Presented to Subcomm. on Intern. Cooperation in Sci. and Space of the House Comm. on Sci. and Astronaut., Washington, D. C., 6 Dec. 1973
(P-5138) Avail: NTIS HC $4.00

The policies concerning the export and import of technology with the Soviet Union are discussed with emphasis on the security and political aspects. The asymmetry of the exchanges is analyzed, and current payment, rather than deferred payment is recommended. F.O.S.

N74-18609# United Nations, New York. Economic and Social Council.
NATURAL RESOURCES DEVELOPMENT AND POLICIES INCLUDING ENVIRONMENTAL CONSIDERATIONS. ADDENDUM: CHANGING PATTERNS IN THE WORLD ENERGY SITUATION
12 Jan. 1971 40 p refs
(E/C.7/2/Add.1) Avail: NTIS HC $5.00

The consumption and production of energy worldwide are cited. Special attention was given to the close interrelationship between energy use and economic development. Energy demand as affected by industrialization, urbanization, and mechanization are disucssed. Statistical tables covering consumption and energy supplies from 1950 to 1968 are included. E.H.W.

N74-18610# Cranfield Inst. of Technology (England).
THE ASSESSMENT OF AN AIR-SUPPORTED AND PROPELLED URBAN TRANSPORT SYSTEM Final Report
Roger Slevin Dec. 1972 115 p refs
(Cranfield-CTS-1) Avail: NTIS HC $8.75

The results are reported of a one-year study intended to assess the usefulness of a new transport technology; that of an urban air-supported and propelled system. The technology is described and its qualitative and quantitative assessment is reported in both absolute and comparative terms. It is concluded that the proposed system has several features which make its application unlikely; in particular there are safety problems, and there is no positive evidence that overall costs would be lower than existing competing modes in conventional circumstances. As a result it is not recommended that any further development of the technology should take place. The report is written as an account of the work undertaken. In this way it provides a guide to the process for future studies of this type. Author

N74-18611# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
ANNUAL REPORT, 1972 [JAHRESBERICHT, 1972]
1972 479 p refs In GERMAN
Avail: NTIS HC $27.00

Theoretical and experimental research work is reported in the aeras of: Fluid mechanics; Aeronautical engineering and flight control; Structural materials, hardness, and construction methods; Energy and propulsion; Electronics; Aerospace physics, space simulation, aerospace medicine; Computer techniques; Aeronautical technology; and Space flight projects. Transl. by G.G.

N74-18612# Weizmann Inst. of Science, Rehovoth (Israel).
SCIENTIFIC ACTIVITIES, 1972
Jacob Rycus, ed. [1973] 483 p refs
Avail: NTIS HC $27.25

Scientific activities are outlined for 1972. Bibliographies and abstracts are presented for each department. Departments included are physics, chemistry, biophysics, biology and science teaching. S.K.W.

N74-18613# National Research Council of Canada, Ottawa (Ontario).
QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT, 1 OCTOBER - 31 DECEMBER 1973
31 Dec. 1973 85 p refs
(DME/NAE-1973(4)) Avail: NTIS HC $7.25

Research projects conducted by the National Research Council of Canada for the period of October to December 1973 are presented. The subjects discussed are: (1) bioengineering developments, (2) wind tunnel development of a low drag, partially streamlined motorcycle, and (3) interaction of electromagnetic fields and living systems with emphasis on birds. Projects conducted by various laboratories of the establishment are briefly summarized. For individual titles, see N74-18614 through N74-18616.

N74-18614 National Research Council of Canada, Ottawa (Ontario).
BIOENGINEERING DEVELOPMENTS: PAST, PRESENT AND FUTURE **c05**
J. A. Tanner and C. Romero-Sierra (Queen's Univ., Kingston) *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 31 Dec. 1973 p 1-4 (For availability see N74-18613 09-34)

The physiological effects of electromagnetic fields to determine the interaction between the organism and its environment were investigated. It was determined that the interaction between non-ionizing electromagnetic fields with living organisms can produce the following effects: (1) demyelination or hypermyelination of peripheral nerves, (2) coupling with EEG activity, (3) disorientation of birds, (4) increase in egg production accompanied by a decrease in longevity, (5) improved wound healing through increased formation of collagen, (6) changes in water metabolism of plants, and (7) stimulation of sensory modalities in biological materials and structures. Author

N74-18615 National Research Council of Canada, Ottawa (Ontario).
THE WIND TUNNEL DEVELOPMENT OF A LOW DRAG, PARTIALLY STREAMLINED MOTORCYCLE **c01**
K. R. Cooper *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 31 Dec. 1973 p 5-26 refs (For availability see N74-18613 09-34)

A series of tests were performed in a 6 ft x 9 ft working section wind tunnel on full-sized motorcycles with riders. The tests were primarily concerned with reducing aerodynamic drag, although all six components of aerodynamic force and moment were recorded. Careful blending of the fairing and the rider in conjunction with fairings on the front wheel forks and disc fairings over the spoked wheels lowered the drag coefficient, based on frontal area, to $C_D = 0.27$ as compared to $C_D = 0.61$ measured on the previous machine. Two world speed records were subsequently set by the motorcycle at the Bonneville Salt Flats. Author

N74-18616 Queens Univ., Kingston (Ontario).
INTERACTION OF ELECTROMAGNETIC FIELDS AND LIVING SYSTEMS WITH SPECIAL REFERENCE TO BIRDS **c04**
C. Romero-Sierra, J. A. Tanner (NRC), and J. BigudelBlanco *In* NRC Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 31 Dec. 1973 p 27-49 refs (For availability see N74-18613 09-34)

Interaction between non-ionizing electromagnetic radiation and living systems is one of the basic life processes. Examples of such interaction are given with particular reference to the effects of microwaves on birds. A model is offered based on a working hypothesis of the law of orientation of birds in the migratory state. Intensity of microwave radiation is discussed in relation to three identifiable levels: (1) heating effects, (2) thermal, non-heating effects, and (3) non-thermal effects. The basis for distinction is given. A new concept of safety level of non-ionizing radiation is presented together with a proposal for expressing such levels in terms of the field vectors instead of power flux density. The presently existing hazard to mankind from the wide scale application of microwave power is weighed against the potential benefits that would follow mastery of the laws of interaction. Author

N74-18617# Office of Telecommunications, Boulder, Colo.
OPERATIONS OF OFFICE OF TELECOMMUNICATIONS, INCLUDING TECHNOLOGY, MANAGEMENT, AND POLICY Annual Report, 1 Jul. 1972 - 30 Jun. 1973
Dec. 1973 56 p refs

(OT-Bull-73-2) Avail: SOD HC $0.60

The mission of the Office of Telecommunication is defined in terms of promoting the economic development, technological advancement, and growth of telecommunication resources. The application of technology, policies, and the management of the federal radio spectrum are discussed. F.O.S.

N74-18618# International Council of Scientific Unions, Washington, D.C. Panel on World Data Centers (Geophysical and Solar).

THIRD CONSOLIDATED GUIDE TO INTERNATIONAL DATA EXCHANGE THROUGH THE WORLD DATA CENTER

Dec. 1973 77 p refs

Avail: NTIS HC $7.00

A compilation is presented of worldwide scientific observations in the following disciplines: solar-terrestrial physics, rockets and satellites, oceanography, glaciology, solid-earth physics and geophysics, and meteorology. Data are presented in many forms - digital, tables, graphs, recordings, photographs, and organized by time and place of observation. Detailed data exchange methods are also described. S.K.W.

N74-18619# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 386

13 Feb. 1974 23 p Transl. into ENGLISH from various Eastern European articles

(JPRS-61213) Avail: NTIS HC $4.25

Articles are presented concerning the development of and progress in the training of computer personnel in Hungary and the state of scientific research in Yugoslavia. For individual titles, see N74-18620 through N74-18621.

N74-18620 Joint Publications Research Service, Arlington, Va.

STATUS OF PLANS FOR TRAINING OF COMPUTER PERSONNEL DETAILED **c08**

Lajos Pomazi *In its* Transl. on Eastern Europe: Sci. Affairs, No. 386 (JPRS-61213) 13 Feb. 1974 p 4-17 Transl. into ENGLISH from Felsooktatasi Szemle (Budapest), no. 12, 1973 p 717-726 (For availability see N74-18619 09-34)

Plans are outlined for the training of computer-oriented specialists in Hungary. Areas of training include: system designers, model developers, programmers, technicians, and assistants. Basic and specialist training in universities and institutions is discussed along with the training of educators. K.M.M.

N74-18621 Joint Publications Research Service, Arlington, Va.

STATE OF SCIENTIFIC RESEARCH EVALUATED **c11**

S. Dautbegovic *In its* Transl. on Eastern Europe: Sci. Affairs, No. 386 (JPRS-61213) 13 Feb. 1974 p 18-20 Transl. into ENGLISH from Oslobodjenje (Sarajevo), 30 Jan. 1974 5 p (For availability see N74-18619 09-34)

The present and projected status of scientific research institutes and researchers in Yugoslavia is discussed. The present allocation for science is 1 percent of the national income and a growth to 2.5 per cent in 1985 is projected. Priority areas for funding are discussed. K.M.M.

N74-18622# Committee on Interior and Insular Affairs (U. S. Senate).

ENERGY CONSERVATION AND S. 2176, PART 2

Washington GPO 1973 845 p refs Hearing on S. 2176 before Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess.) 1 Aug. 1973

Avail: Comm. on Interior and Insular Affairs

Hearings are reported describing the role of energy conservation in national energy policy. Conservation in transportation, housing, and in the industrial sector are emphasized. Ways to educate consumers to use energy more efficiently especially regarding motor vehicles and home appliances are outlined. S.K.W.

N74-18623# Decision Sciences Corp., Jenkintown, Pa.

QUANTITATIVE ENERGY STUDIES AND MODELS: A STATE OF THE ART REVIEW

Dilip R. Limaye, Robert Ciliano, and John R. Sharko [1973] 50 p refs Sponsored by Council on Environmental Quality, Executive Office of the President

Avail: NTIS HC $5.50

A state of the art review of quantitative energy studies and models is summarized. The objective of this review was to evaluate analytical studies of energy relative to the development of a comprehensive model for analyzing the probable environmental consequences of energy policy options. The review includes an examination of the significant characteristics of each study and a comprehensive bibliography of the current research work involving analytical techniques for the evaluation of energy policy issues. Author

N74-18624# Atomic Energy of Canada Ltd., Chalk River (Ontario). Chemistry and Materials Div.

[RESEARCH IN THE FIELDS OF SOLID STATE SCIENCE, GENERAL CHEMISTRY, PHYSICAL CHEMISTRY, AND MATERIALS SCIENCE] Progress Report, 1 Jan. - 31 Mar. 1973

Apr. 1973 116 p refs

(AECL-4509; PR-CMa-29) Avail: AEC Depository Libraries HC $8.00; Atomic Energy of Can., Ltd., Chalk River: $2.50

Research is reported in the fields of solid-state science, general chemistry, physical chemistry, and materials science. New, previously unreported results include anisotropy of damage in ion-implated GaAs and GaP, cross section and excitation curve for I-127 (n,2n) I-126 sources of He production in thermal neutron-irradiated Ni-based alloys; calculated bulk and perpendicular surface Debye temperatures of metals from Morse potentials; solubility of NiTeO3; CO-60 activities and Fe deposition rates on CANDU fuel bundles, electrochemical H/D separation factors on Fe, Mo, and W electrodes; H yields and isotope effects from Febetron radiolysis of water vapor; comparison of calorimetric and chemical dosimeters for reactor dosimetry; spectra and solvated electron yield in pulse-irradiated biphenyl-ethylamine and pyrene-methylamine solutions; K-39 NMR in methylamine; stress-corrosion cracking of Zircaloy and Zr alloys in aqueous chloride, organic, and iodine-organic solutions. NSA

N74-18625# California Univ., Livermore. Lawrence Livermore Lab.

ENVIRONMENTAL ANALYSIS Summary Report, fiscal year 1973

B. N. ODell 5 Jul. 1973 19 p refs

(Contract W-7405-eng-48)

(UCRL-51422) Avail: NTIS HC $4.00

Four environmental analysis and feasibility studies are presented. Topics include. (1) a comparison of the absolute Borrmann transmission of Ge and CdTe detector grade crystals; (2) thermoluminescence of asbestos; (3) an analysis of marine sediment; and (4) using the thermoluminescene of beach sand as a tracer. K.M.M.

N74-18626# Mound Lab., Miamisburg, Ohio.

[RESEARCH ACTIVITIES FOR MOUND LABORATORY, JANUARY - JUNE 1973]

W. T. Cave and R. E. Vallee 22 Aug. 1973 58 p refs

(Contract AT(33-1)-GEN-53)

(MLM-2068) Avail: NTIS

Erratic results from two experiments in which attempts were made to determine the viscosity coefficient of uranium are discussed briefly. NSA

N74-18627# RAND Corp., Santa Monica, Calif.

COMPARISONS OF SOVIET AND US TECHNOLOGY

Robert Perry Jun. 1973 49 p refs

(Contract F44620-73-C-0011)

(AD-771004; R-827-PR) Avail: NTIS CSCL 05/1

The military sector of Soviet R and D may be more efficient than the civilian sector; and in some respects, particularly in aircraft development, the Soviet military R and D system appears to be more efficient than U.S. military R and D. One consequence is that the U.S.S.R. seems capable of generating more system options at lower costs and presumably with less risk than the U.S. in the present system acquisition environment. A second finding of this study is embodied in the demonstration that the extent of Soviet technological advancement can be ascertained for one specialized regime of military technology--turbine engines, in this instance--and the methodology developed

in that demonstration can be applied to several areas of technology. Even if there is uncertainty about some of the underlying data, military goods and services should be expressed in terms that uniformly reflect Soviet rather than U.S. manufacturing methods and input quantities. Author (GRA)

N74-18628# Air Force Systems Command, Washington, D.C.
PROCEEDINGS OF THE AIR FORCE SYSTEMS COMMAND 1973 SCIENCE AND ENGINEERING SYMPOSIUM, VOLUME 1
Oct. 1973 695 p refs Conf. held at Kirtland AFB, N. Mex., 2-4 Oct. 1973
(AD-771618; AFSC-TR-73-003-Vol-1) Avail: NTIS CSCL 05/2

This is a collection of the unclassified papers presented at the 1973 Air Force Systems Command AFSC Science and Engineering Symposium at Kirtland Air Force Base, Albuquerque, New Mexico. The papers cover a wide variety of technical subjects representing outstanding achievements by AFSC scientists and engineers. (Modified author abstract) GRA

N74-18629# National Academy of Engineering, Washington, D.C.
TRANSPORATION AND THE PROSPECTS FOR IMPROVED EFFICIENCY
Jul. 1973 268 p refs Symp. held 12-13 Oct. 1972; sponsored in part by NSF, HUD, DOT, Natl. Acad. of Eng.
(PB-221429/1GA; ISBN-0-309-02120-0) Avail: NTIS MF $1.45; HC $7.00 National Academy of Engineering CSCL 13B

The proceedings present the views of experts from government, industry, and the academic community as they seek to identify urban transportation problems and related modal interface problems; to describe the relationship of urban transportation to urban development, design, and renewal; and to point out institutional barriers that impede progress in urban transportation. The proceedings also concern different approaches to urban transportation and urban development that have been used successfully in various municipal areas, including Dallas, Chicago, San Francisco, and Washington, D.C. GRA

N74-18630# Bureau of Mines, Bartlesville, Okla.
BUREAU OF MINES ENERGY PROGRAM, 1972
Bill Linville and John D. Spencer Aug. 1973 117 p refs
(PB-224399/6GA; BM-IC-8612) Avail: NTIS HC $4.25 CSCL 21D

During calendar year 1972, the Bureau of Mines was engaged in some 20 major areas of research for development of new and improved efficient methods of conservation and utilization for petroleum and natural gas, oil shale, and coal. Numerous projects are described. Based on this research, 186 technical reports were published by the Bureau or others, and numerous other reports were prepared for U.S. Government agencies, State agencies, and organizations engaged in cooperative research programs with the Bureau. Author (GRA)

N74-18631# Harvard Univ., Boston, Mass. Graduate School of Business Administration.
THE ADMINISTRATION OF TRANSPORTATION MODELING PROJECTS Ph.D. Thesis
John W. Drake 31 May 1972 266 p refs
(Contracts DOT-UT-381; DOT-MA-06-0019)
(PB-224846/6GA; UMTA-MA-06-0019-72-1) Avail: NTIS HC $15.50 CSCL 13B

The study examines the way in which modeling projects are administered, concentrating on the interactions between and characteristics of the decision makers and modelers. The objective is to learn which factors correlate with models which are considered useful by decision makers. Over fifty U.S. and European projects were studied, fifteen in detail. Both qualitative and statistical factors of operational use were investigated including recognition of the distinction between the roles of decision maker and analyst, the closeness of backgrounds, complexity of techniques used, the extent to which project included consideration of social, economic and political factors, the degree of bureaucracy in the decision maker's environment and the relative usefulness of European versus U.S. models. GRA

N74-18632# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 27, NO. 9
Arthur W. Frisch, ed. and Victoria Hewitson, ed. 30 Sep. 1973 34 p refs
(AD-771187; ESN-27-9) Avail: NTIS CSCL 05/2

The monthly publication presents brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. (Modified author abstract) GRA

N74-18633# Transportation Systems Center, Cambridge, Mass.
ENERGY STATISTICS: A SUPPLEMENT TO THE SUMMARY OF NATIONAL TRANSPORTATION STATISTICS Final Report, Jun. - Jul. 1973
Gill V. Hicks Sep. 1973 94 p refs
(PB-225331/8GA; DOT-TSC-OST-73-34) Avail: NTIS HC $3.75 CSCL 05C

The report is a compendium of selected time series data describing the transportation, promotion, processing, and consumption of energy. The report is divided into three main sections. The first contains such items as the revenues and expenses of oil pipeline companies, number and capacities of U.S. tank ships, and the total crude oil transported in the U.S. by methods of transportation. The second section reveals the growth over time of the U.S. oil and natural gas reserves, refinery capacity, and yields. Trends in demand for fuel and power are displayed in the third section. Throughout this part, the transportation sector is emphasized. Included are the gasoline and oil costs of automobiles of different sizes, the consumption of petroleum by type of product, the energy intensiveness of the air carriers, the electrical energy consumed by the local transit industry, and other important statistics describing the supply and demand for energy. GRA

N74-18634# Kentucky Univ., Lexington. Coll. of Engineering.
PROCEEDINGS: ENERGY RESOURCE CONFERENCE (2ND)
Aug. 1973 59 p Conf. held at Lexington, Ky., 24-25 Oct. 1972
(PB-224750/0GA; UKY-TR-70-73-CEED4) Avail: NTIS HC $5.00 CSCL 10A

Recent available information on the rapidly changing energy resource picture, fuel policies and consumer demands is presented. Papers by knowledgeable government officials and industrial representatives are included. Topics covered include new developments in the extraction of natural gas and crude oil, interfuel conversion (coal to gas and oil, coal to gas by the Lurgi process, SNG and oil), the role of the Federal Government to insure an adequate, reliable energy supply, and the transmission and transportation of energy. GRA

N74-18635# Naval Research Lab., Washington, D.C.
NRL PROGRESS REPORT, JUNE 1973
Jun. 1973 95 p refs
(PB-224874/8GA) Avail: NTIS HC $3.00 Also available on subscription $22.50/year domestic, $28.25/year foreign CSCL 05B

Contents: Plasma physics at NRL LINUS - An approach to controlled fusion through the use of megagauss magnetic fields; fluorinated network polymers; progress notes in chemistry, electronics, metallurgy, ocean technology, radar, solid state physics, space systems, and supporting techniques. GRA

N74-18636# Mitre Corp., Bedford, Mass.
CURRENT TRENDS IN DATA MANAGEMENT SYSTEM ARCHITECTURE
J. A. Singer Mar. 1973 25 p refs Presented at the USAF Acad. Worldwide Data Management Symp. on Design and Evaluation, Air Force Acad., Colo., 9-11 Dec. 1971
(Contract F19628-71-C-0002; AF Proj. 572M)
(AD-771006; MTR-2303; ESD-TR-72-157) Avail: NTIS CSCL 09/2

Early data management system architecture is examined and compared with that of current systems. This comparison reveals a trend toward placing a number of basic data management

system components within the modern operating system. A continuation of this trend is postulated and a number of specific examples of areas where the trend is likely to continue are given. The advantages of a continuation of this trend are described in terms of both the ease of building new data management systems and the increased compatibility of such systems with other data processing tools. Author (GRA)

N74-18637# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
FORWARD AIR CONTROLLER: TACTICAL AIR COMMAND PILOT COMMUNICATION ORIENTATION Final Technical Report
P. B. DeVries, Jr. and J. I. Laveson 30 Aug. 1973 86 p refs
(Contract F44620-72-C-0068; AF Proj. 9778)
(AD-771071; MDC-E0888; AFOSR-73-1994TR) Avail: NTIS CSCL 17/8

The overall objective of the research was to determine if a standardized lexicon of terrain features could be of benefit to Forward Air Controllers (FACs) and Tactical Strike Pilots (TACs) in target acquisition operations. Sixty experienced pilots were asked to view aerial photographs of 21 different terrain features, and to state what they would call each feature and list characteristics of each. There were five major research objectives: Review of the scientific literature pertinent to FAC-TAC communication orientation, the experimental determination of the most commonly used terrain descriptors, development of a standardized lexicon, an evaluation of the performance of aircraft pilots using the derived lexicon, and a separate effort to determine the applicability of the theory of signal detection to real-time perceptual problems of FAC-TAC operations. GRA

N74-18638# Defense Documentation Center, Alexandria, Va.
ENERGY CONVERSION Report Bibliography, Jan. 1974 - Aug. 1973
Jan. 1974 409 p refs
(AD-771750; DDC-TAS-74-2) Avail: NTIS CSCL 10/2

The bibliography is a compilation of 287 references on Energy Conversion. Citations are sequenced numerically within each of the following categories: (1) Fuel Cells; (2) Mineral Fuels; (3) Nuclear Energy; (4) Solar Energy; (5) Steam Power; (6) Thermionic Generators, (7) Thermoelectric Generators; (8) Geopolitical Energy Studies, and (9) Miscellaneous Studies. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract Number, and Report Number Indexes are included.
Author (GRA)

N74-18639# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONTROL IN SCIENTIFIC SYSTEMS
V. M. Glushkov, ed. 10 Dec. 1973 9 p Transl. into ENGLISH from Upravlyayushchie Sistemy i Mashiny (Kiev), no. 1, Sep. - Oct. 1972 p 136-138
(AD-771886; FTD-HT-23-552-74) Avail: NTIS CSCL 09/2

The paper briefly reviews a symposium, the theme which was the increase in efficiency of the control of science as a complex problem. This includes informational, economic, organizational, technical, and social aspects of control. GRA

N74-18640# Army Natick Labs., Mass.
CONCEPT FOR A MULTIPLE PERSONNEL AIRDROP SYSTEM
James F. Falcone Nov. 1973 22 p ref
(DA Proj. 1F1-62203-A-33A)
(AD-771945; USA-NLABS-TR-74-15-AD) Avail: NTIS CSCL 15/7

In order to achieve significant improvement in the Army's airdrop capabilities, unconventional and even radical concepts along with more sophisticated techniques must be considered. One valid concept for reduction of dispersion employs multiple exit of troops from the aircraft. This can be accomplished by use of a container or structure which will deliver a squad size, or larger, fighting unit completely equipped and ready for immediate action upon landing. A particular configuration of a multiple personnel airdrop system is described in detail along with some suggested variations and options of the basic concept. (Modified author abstract) GRA

N74-18641# Bell Telephone Labs., Inc., Whippany, N.J.
SAFEGUARD SYSTEM - TREE HARDNESS ASSESSMENT FOR SPARTAN INTERFACE CIRCUITS, CASE 27950-2140
E. C. Snyder 5 Dec. 1973 25 p refs
(Contract DAHC60-71-C-0005)
(AD-772284) Avail: NTIS CSCL 16/4

The memorandum addresses the vulnerability of the SPARTAN missile interfaces to neutron and ionizing radiation. GRA

N74-18034* California Univ., Berkeley. Center for Remote Sensing Research.
INTERCHANCE AND COOPERATION WITH USER AGENCIES Special Study No. 5
D. T. Lauer *In its* An Integrated Study of Earth Resources in the State of Calif. Using Remote Sensing Tech. 31 Dec. 1973 27 p (For availability see N74-18025 09-13)
CSCL 05B